

NETWORK WORLD

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Frame relay: Bringing it into focus

First in a three-part series exploring frame relay technology. Subsequent articles will examine vendors' plans to support the technology and how it will affect user networks.

By Jim Brown
Senior Editor

Carriers and equipment vendors have been talking up the capabilities of frame relay, an emerging packet-switching technology that promises to support such high-bandwidth applications as interconnecting remote local-area networks.

Netrix, Wellfleet to support frame relay specification.
See story, page 4.

But many people are confused about what frame relay is and what benefits it can provide. Part of the confusion arises because frame relay is often spoken of in the same breath as fast packet switching.

"People have made this [frame relay and fast packet discussion] into the most obtuse thing," says Mary Modahl, an analyst with Forrester Research, Inc., a consulting firm in Cambridge, Mass., that just published a report detailing how frame relay will affect users.

(continued on page 83)



John Glaser



Robert Beckley

Hospital to replace minis with microcomputer LANs

By Wayne Eckerson
Senior Writer

BOSTON — Brigham and Women's Hospital here has embarked on a three-year, \$7.5 million effort to replace 13 minicomputers with a series of local-area networks that will support more than 50 servers and 2,000 personal computers.

The new network will enable the 720-bed teaching hospital to meet its rapidly expanding computing needs while providing physicians and nurses with computer-based expert assistance in caring for patients, said Robert Beckley, director of technology planning at the hospital.

"We are simply running out of gas with our current setup," Beckley said. "The client/server

approach [of the new LAN] gives us more horsepower for the same price and makes it easy to add new users and applications without compromising performance."

Brigham and Women's 13 Data General Corp. minicomputers support 1,400 dumb terminals; the hospital has been adding about 300 terminals per year. At (continued on page 82)

Unisys unfolds open network blueprint

Company's Integrated Information Environment charts course for linking computers, applications.

By Paul Desmond
Senior Editor

NEW YORK — Unisys Corp. last week announced a network architecture that promises to help users link disparate Unisys processors to one another and, using OSI protocols, to machines from other vendors.

Unisys' new Integrated Information Environment (IIE) is intended to serve as a blueprint that aids in the process of building networks and developing interoperable applications. It also spells out Unisys' strategic product directions to help users in making hardware and software investments.

IIE is Unisys' first complete plan detailing how it will network its various computing platforms, though it has already rolled out an extensive suite of Open Systems Interconnection, Transmission Control Protocol/Internet Protocol and IBM Systems Net-

work Architecture products.

Unisys was formed in 1986 when Burroughs Corp. bought out Sperry Corp. The company has since acquired workstation vendor Convergent Technologies, Inc. and multiplexer vendor Timeplex, Inc.

"Think of [IIE] as the common superstructure that sits on top of our hardware platforms and brings them together, giving us greater unity in our product lines (continued on page 84)

FEATURE



10BaseT products hit market

By Edwin Mier
Special to Network World

Although the ink is still wet on the 10BaseT standard, which provides full Ethernet functionality over unshielded twisted pair, dozens of vendors are rushing products to market that are reportedly 10-BaseT-compliant.

Whether they really do comply is naturally the question. Still, the lure of 10BaseT is obvious. It's far easier to install than Ethernet's original coaxial cable and the more recent thin coaxial alternative.

One consulting firm, CIMI Corp. of Voorhees, N.J., projects that by the end of next year, more than half of all new Ethernet shipments will be based on 10BaseT and by the end of 1993, nearly 90% of all Ethernet shipments will be based on the standard.

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NETLINE



AT&T TO UNVEIL cell relay switches that allow carriers to offer high-speed switched data services. Page 2.

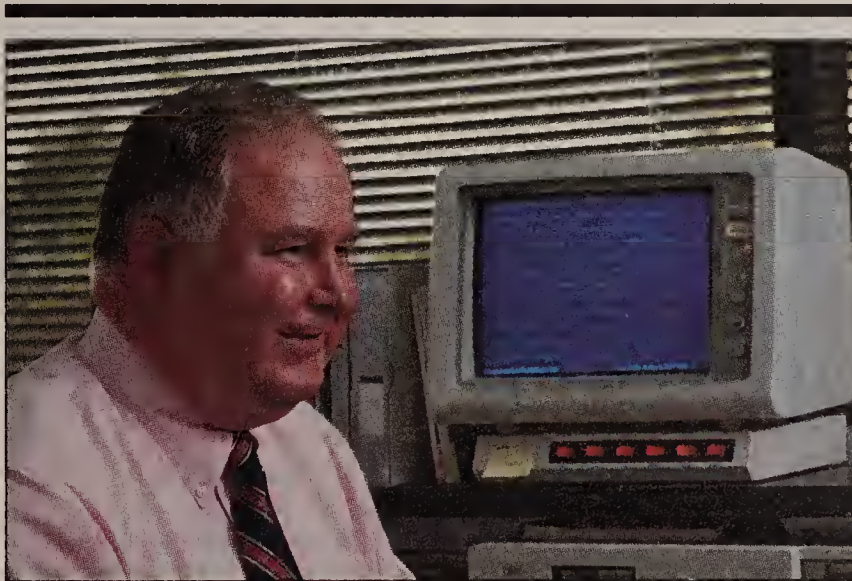
HOTEL CHAIN HOPES to improve customer service with new global reservation net. Page 2.

HP SET TO INTRODUCE a new version of its OpenView soft-

ware that runs on Sun workstations. Page 2.

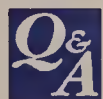
THE BAD REPUTATION of 900 services is making businesses hesitant to implement the technology. Page 4.

DATA COMPRESSION clears the alligator of bandwidth limitations out of Ashton-Tate's swamp. Page 87.



Bud Huber, president of the User Alliance for Open Systems

'Houston 30' chief speaks his mind on open systems



In its brief history, the User Alliance for Open Systems (UAOS) — formerly the Houston 30 — has garnered a great deal of attention for its outspoken efforts to accelerate the development and deployment of open systems.

Bud Huber is the newly elected president of UAOS, which comprises network and information systems (IS) managers from

some of the nation's largest companies.

Huber, who is manager of advanced networking integration at Hughes Aircraft Co. in Long Beach, Calif., spoke with *Network World* Senior Writer Wayne Eckerson about a variety of issues, including UAOS' strategy and tactics, and its recent decision to join the Corporation for (continued on page 85)

AT&T Net Systems Group to unveil cell relay switch

Firm's multiprotocol BNS-2000 will allow carriers to offer switched, high-speed data net services.

By Bob Wallace
Senior Editor

LISLE, Ill. — AT&T Network Systems Group is expected to announce a cell relay switch that will enable carriers to offer switched, high-speed data communications services at its Universal Information Services Showcase here this week.

According to AT&T Network Systems documents, the new BNS-2000 Broadband Networking Family will be used by carriers to offer Switched Multi-megabit Data Services (SMDS) based on the IEEE 802.6 standard for metropolitan-area networks.

Cell relay switches are packet switches that support multiple

protocols including asynchronous, synchronous, X.25 and frame relay, and accommodate far higher transmission speeds — T-1, T-3 and higher — than existing packet switches.

Efficient, inexpensive

SMDS networks built using cell relay switches will provide users with an efficient and inexpensive means of supporting metropolitan-area data networks for applications such as local-area network interconnection, imaging and transmission of computer graphics.

"SMDS meets the needs users have today and is an evolutionary

(continued on page 85)

Hyatt chain cuts over new global reservation network

Net designed to give hotel the edge in service.

By Bob Brown
Senior Editor

CHICAGO — Hyatt Hotels Corp. last week said it cut over a \$12 million global reservation network that will bolster customer service by facilitating employee access to data.

The network is designed to enable Hyatt personnel worldwide to access room availability data at any sister hotel and summon customers' historical files instantly, capabilities aimed at giving the hotel chain a competitive edge.

"This is vital in an industry where customer service is a key differentiator between hotel chains," said John Biggs, Hyatt's

senior vice-president for hotel accounting and administration.

Hyatt's network upgrade began in mid-1989, after the company decided to scrap an IBM 4381 mainframe that had been supporting its reservation system since 1982. The company recently replaced the mainframe with a troika of Unix-based AT&T System 7000 on-line transaction processing servers.

In order to support the Unix hosts at its reservation system data center in Oakbrook Terrace, Ill., and other AT&T and Hewlett-Packard Co. Unix minicomputers it had been installing in hotels

(continued on page 86)

HP's new OpenView will run on Sun workstations

By Jim Brown
Senior Editor

PALO ALTO, Calif. — Hewlett-Packard Co. is scheduled to announce this week a new version of its OpenView Network Management Server software that will run on Sun Microsystems, Inc. workstations.

This will make HP the first major vendor of integrated net management systems to introduce a version of its product for another vendor's hardware. The company said it will demonstrate the new offering at the INTEROP 90 Conference and Exhibition this week in San Jose, Calif.

"It's kind of a gutsy move on HP's part to offer OpenView on a

competitor's platform," said David Passmore, a partner with Ernst & Young's Network Strategies in Fairfax, Va. Typically, he said, vendors have used net management systems as a way to further hardware sales.

IBM NetView customers, for example, are likely to buy additional IBM equipment, Passmore said. But HP's strategy is to sell more of its network management software by giving users a choice of hardware.

The new version, OpenView Network Management Server for Sun, performs the same functions as the existing product that runs on HP 9000 minicomputers and

(continued on page 84)

Briefs

Xerox copier to support LAN link. Xerox Corp. last week announced a copier/printer that digitizes images for reproduction instead of using photocopying technology. It also promised a future upgrade that will enable the machine to act as a print node on a local-area network.

The car-sized DocuTech Production Publisher, the first offering in Xerox's new DocuTech Publishing Series, will enable customers to scan documents using a 600 dot-per-inch scanner, as well as print, store, retrieve or manipulate the image.

Next year, the company plans to introduce field upgrades that will enable the machine to support a DocuTech Network Server running Novell, Inc.'s NetWare network operating system, making it possible to produce documents transmitted over networks such as AppleTalk and those based on the Transmission Control Protocol/Internet Protocol.

10BaseT ratified as official standard.

The 10BaseT Task Force of the IEEE 802.3 committee last week announced that the 10BaseT standard for running Ethernet over unshielded twisted-pair wire was officially approved. In another development, 14 vendors demonstrated interoperability between their 10BaseT products at Ungermann-Bass, Inc.'s headquarters in Santa Clara, Calif. Participants included Ungermann-Bass, AT&T, Cabletron Systems, Inc., David Systems, Inc., Digital Equipment Corp., SynOptics Communications, Inc. and 3Com Corp.

VW invests in VSATs. Volkswagen of America, Inc. this week will announce it has signed Scientific Atlanta, Inc. to build an 850-node very small aperture terminal satellite network to service the carmaker's dealers nationwide. The satellite network will replace a terrestrial net and support data and video transmissions.

Backhoe cowboys rope another one.

A backhoe operator working on an Ohio Turnpike bridge in North Royalton, Ohio, severed an MCI Communications Corp. fiber cable on Sept. 15, knocking out 50,000 switched and dedicated circuits for as long as six hours. The fiber was cut at 9:15 a.m. Eastern Standard Time (EST) and disrupted service to users in parts of seven states. Service was restored by 3 p.m. EST. The fiber extends from

Willow Springs, Ill., to Perryman, Md. States affected included Ohio, Illinois, Indiana, Michigan, Maryland, Pennsylvania and West Virginia.

Siemens forms new PBX unit. Siemens U.S. last week announced the formation of a new company responsible for its private branch exchange businesses in the U.S. Siemens Private Communications Systems, Inc. (SPCS) will hold Siemens' interest in Rolm Systems, Tel Plus Communications Co. and Rolm Co., a Siemens and IBM joint venture. The new company will include Siemens' PBX development division in Boca Raton, Fla., a manufacturing plant in Cherry Hill, N.J., and its group of independent distributors. Peter Pribilla, group president of Siemens AG Private Communication Systems Group will be vice-chairman of SPCS. Jost Hammerschmidt, formerly vice-chairman of Siemens Information Systems, Inc., will serve as president and chief executive officer for SPCS.

Apple proposes wireless data nets.

In its comments to the Federal Communications Commission on how the personal communications network (PCN) industry should be regulated, Apple Computer, Inc. suggested that the FCC focus its efforts on high-speed wireless data communications between personal computers by allocating spectrum in the 1.7- to 2.3-GHz range for data personal communications services. Apple promised to deliver to the FCC a detailed proposal on how laptop personal computers, equipped with low-power transmitters, could send data at 10M bit/sec at distances of no more than a few hundred feet in buildings equipped with PCN cells.

COS to form new RIG. The Corporation for Open Systems International's (COS) Requirements Committee will host a meeting Oct. 18 to form a COS Requirements Interest Group (RIG) for the banking, insurance and brokerage industries. The RIG would help guide COS' efforts in communications standards of particular interest to those industries, according to G. Dick Lefkon, president of the Financial Industries Chapter of the Data Processing Management Association. The meeting will be held at the World Trade Center in New York. Interested parties should contact COS' Cheryl Freeman at (703) 883-2732, or Lefkon at (212) 663-2315.

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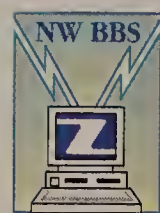
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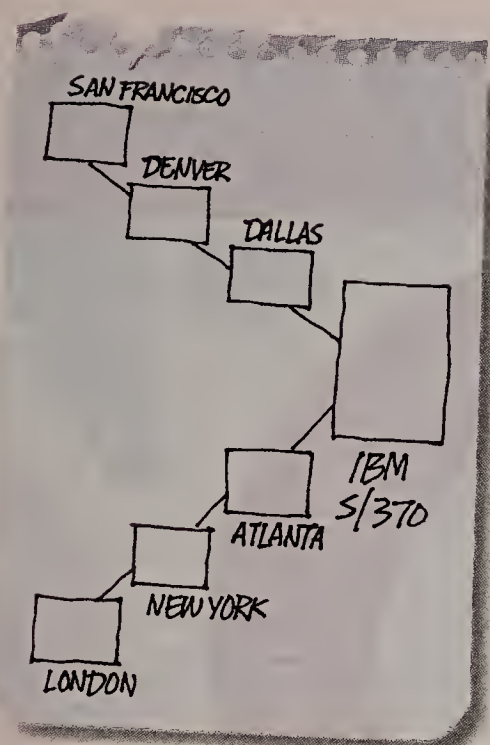
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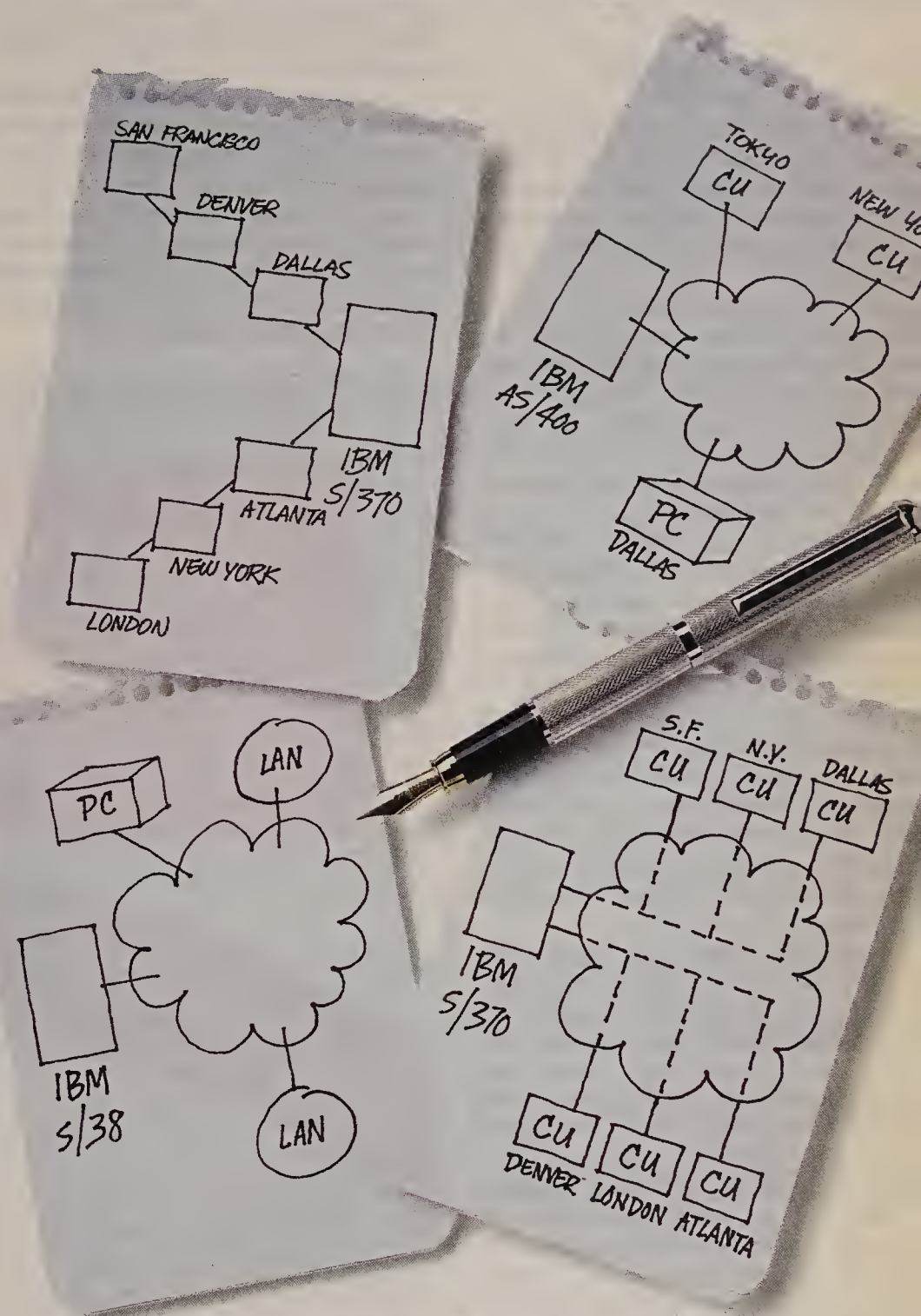
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Firms pledge to back fledgling frame relay spec

By Paul Desmond
Senior Editor

SAN JOSE, Calif. — Support for a new frame relay specification unveiled last month is expected to build this week when Netrix Corp. and Wellfleet Communications, Inc. announce plans to embrace the specification.

In its first announcement regarding frame relay, Wellfleet is expected to unveil support on its line of bridge/router products for the specification developed by Cisco Systems, Inc., Digital Equipment Corp., Northern Telecom, Inc. and StrataCom, Inc. ("Firms join to speed frame relay rollout," *NW*, Sept. 10).

The specification, which mirrors the ANSI frame relay standard, is supposed to serve as a common implementation of the standard that vendors can follow to build compatible frame relay interfaces for their products.

Netrix, which has already said it intends to support frame relay on its #1-ISS circuit/packet switch, will also announce support for the specification, including the Local Management Interface (LMI) portion, which contains management capabilities beyond those specified in the ANSI standard.

In addition, Netrix is expected to announce that it will conduct interoperability testing of its frame relay interface with those of Advanced Computer Communications, Cisco Systems, DEC, Infotron Systems Corp. (which resells the #1-ISS), Northern Telecom, Proteon, Inc., Sprint Data Group and Wellfleet as those firms offer frame relay support on their products.

Both announcements should lend credence to the claims of the four original developers that their frame relay specification is an open one and that the group welcomes the support of other vendors.

Building on the standard

According to Thomas Jones, vice-president of marketing at Netrix, LMI is an extension to the ANSI frame relay specification. It defines how a device such as a router or bridge communicates management information with a local network node, such as a T-1 multiplexer, that also supports frame relay.

One portion of LMI defines how two devices convey information to each other regarding the status of virtual circuits supported by the devices. For example, messages can be exchanged to indicate that a new virtual circuit has been established or that one was deleted.

LMI can also be used, for example, by a bridge to let a T-1 multiplexer know that it is still active even though no data is flowing through it. Without such a mechanism, a switching node may perceive that an attached device has failed when in fact there is simply no data coming from it, Jones said.

The ANSI frame relay specification also deals with management issues, but not on a local basis, Jones said. Rather, it uses explicit congestion notification (ECN) bits to handle flow control over the wide-area network.

ECN bits are used, in effect, to let one network switching node tell another to

slow down if the network is becoming congested, Jones said.

The ANSI standard also defines a discard eligibility bit, which helps in congestion control by marking frames that should be discarded if congestion occurs. Such frames may contain low-priority data or may be coming from a device that is exceeding its share of allotted network bandwidth, he said.

Jones stressed that Netrix and the other vendors supporting extensions to the ANSI standard will also support all of the features specified by ANSI.

He declined to say when Netrix's frame relay interface will ship or how much it will cost. Wellfleet's frame relay interface will ship in the spring of 1991 as a free option to its bridge/router products. **Z**

Stigma surrounding 900 services is keeping corporate users wary

Industry groups vow action to improve reputation of services.

By Bob Brown
Senior Editor

WASHINGTON, D.C. — The controversy about abuses of 900 services by con artists and pornographers is keeping many users from embracing pay-per-call services that could help their businesses, industry watchers said last week.

A growing number of corporate users are discovering business-to-business and business-to-customer applications for 900

services that include customer support and dissemination of product information. But many net managers continue to avoid 900 services because of their tainted reputation.

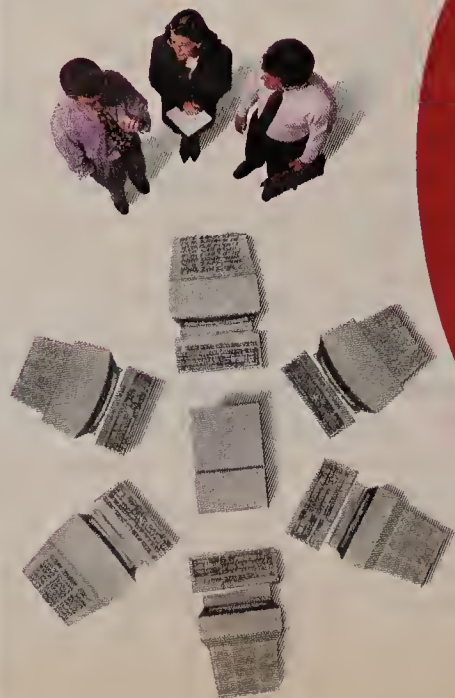
That problem has prompted two industry groups to propose standards of practice for 900 service providers that they hope to implement this fall.

There is also concern that a bill designed to regulate the 900 services indus-

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try, which was introduced recently by Rep. Bart Gordon (D-Tenn.), goes too far. It could make the deployment of 900 services difficult for users and could put

"There's no doubt that 900 services are no longer just a medium for residential and consumer information; businesses are catching on," said Steve Metalitz, vice-

"But we need to be sure that an unscrupulous minority of players doesn't ruin this business opportunity for everyone else," he added.

That opportunity is big, according to Bruce Kushnick, president of Strategic TeleMedia, a New York-based market research and consulting firm. The market for 900 services is expected to explode from \$455 million last year to \$750 million this year, a 65% increase, he said.

"The market is rapidly shifting to direct response applications, creating a new marketing and billing channel for corporations," Kushnick said.

Leading 900 service providers, including the Big Three long-distance carriers, are increasingly eyeing their large
(continued on page 84)

U.K. price caps may lower int'l service rates

By Barton Crockett
Senior Editor

LONDON — The U.K.'s chief network regulator last week called for the implementation of price caps on British Telecommunications PLC's international services and the legalization of international switched voice resale.

Users and analysts praised the proposed rule changes, saying they could lead to low-cost service options and make it easier for users to sell off excess capacity on private lines.

In an official notice to the country's secretary of state for trade and industry, Bryan Carsberg, director of the U.K.'s Office of Telecommunications (OfTel), said price caps and capacity resale are needed to lower international service prices and increase competition.

Carsberg said competition between British Telecom and Mercury Communications, Ltd. has failed to produce needed price reductions on the international front and that new regulations are needed to assure that U.K. consumers aren't gouged for global services.

"The contribution made to [British Telecom's] return on investment by in-
(continued on page 85)

Federal Reserve upgrading funds transfer system

By Barton Crockett
Senior Editor

BOSTON — The Federal Reserve System has embarked on a five-year effort to upgrade FedNet, a vital financial network that handles about a trillion dollars a day in funds transfers among U.S. banks.

The Federal Reserve System will replace disparate systems in the 12 regional Federal Reserve bank networks that make up FedNet with a common set of network equipment running standard protocols.

The Federal Reserve will also upgrade the backbone net linking its regional facilities by replacing 56K bit/sec links with T-1 and fractional T-1 circuits. The moves will increase FedNet's capacity and improve service to customer banks.

According to Jerry Giacciai, FedNet project manager and vice-president for data systems at the Federal Reserve Bank of Boston, the upgrade will enable FedNet to support rising traffic, improve disaster recovery capabilities and enhance network service.

"The principal reason for this is to improve service to the customer and to improve the reliability and availability of the network," he said.

Giacciai said the Reserve plans to decide by next year which products and protocols it will use.

He said the upgrade is expected to be completed over a five-year period.

Currently, each of the 12 Federal Re-
(continued on page 86)

"There's no doubt that 900 services are no longer just a medium for residential and consumer information."

▲▲▲

small, innovative 900 service providers out of business, according to opponents (see "Congress examines 900 service abuses," page 13).

president and counsel for the Information Industry Association (IIA), a Washington, D.C. trade group representing information service providers.

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Nynex takes strides to quell FCC concerns about accounting fraud

New England Tel, New York Tel agree to \$35.5m reduction in interstate rates, \$32.6m write-down and other concessions.

By Bob Brown
Senior Editor

WHITE PLAINS, N.Y. — The Federal Communications Commission last week said Nynex Corp. agreed to a settlement that would end an investigation into alleged accounting violations by the firm's operating companies.

New England Telephone and Telegraph Co. and New York Telephone Co. agreed to

make a combined, onetime \$35.5 million reduction in interstate rates, take a \$32.6 million write-down in assets and hand over a \$1.4 million voluntary contribution to the U.S. Treasury.

In exchange, the FCC agreed to suspend its probe into allegations that the carriers paid too much for equipment and services from Nynex Material Enterprises Co. (MECO), a purchasing group.

Because the rate reduction will be passed on mainly to long-distance carriers — which may or may not pass the savings on to customers — the agreement probably will have little bearing on Nynex customers, said John Bain, an analyst at Raymond James & Associates, Inc., a St. Petersburg, Fla., investment firm.

But the agreement will rid Nynex of a major distraction, enabling it to serve customers better by refocusing on cost containment and delivery of new services, a Nynex spokesman said.

In a separate announcement, the New York Public Service Commission (PSC) released a report in which its general counsel recommended that the PSC force Nynex to divest itself of New York Telephone.

The report said divestiture is necessary

to ensure that local telephone customers do not get hit with higher rates passed on by Nynex to subsidize fines or settlement costs incurred as a result of MECO activities from 1984 to 1988. The PSC immediately authorized a study of the divestiture proposal.

In a statement, Nynex Chairman and Chief Executive Officer William Ferguson said that "divestiture of New York Telephone by Nynex is not an option for consideration."

As part of Nynex's effort to "paint bright lines" around its regulated businesses and avoid future investigations into its business practices, the carrier last week announced the merger of its beleaguered MECO unit with Nynex Service Co. to form a new unit dubbed Telesector Resources Group, Inc. This group, which will be jointly owned by New York Telephone and New England Telephone, will provide centralized planning, marketing and purchasing to Nynex's operating companies. □

To join local area networks together, LAN administrators have traditionally relied on bridges, routers, repeaters, gateways, and enough wires to give birth to a small electric company.

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Net managers must tie OSI to business needs

By Ellen Messmer
Washington Correspondent

FALLS CHURCH, Va. — An executive at a leading U.S. chemical company last week said that unless network managers make a firm business case for OSI, upper management will not back their plans.

Speaking at the 6th International Conference on the Application of Standards for Open Systems, Paul Pinson, manager of E.I. du Pont de Nemours & Co.'s open systems program office, warned attendees that technical merits are not enough to sell top management on migrating to an Open Systems Interconnection environment.

Du Pont has large Digital Equipment Corp. DECnet and IBM Systems Network Architecture networks that are connected by gateways, a considerable investment that management did not intend to abandon.

Pinson said du Pont's technical managers last December persuaded top executives that OSI is a strategic direction after they pegged measurable business benefits to the migration.

"Du Pont is interested in interoperability from open systems because we are a global company," Pinson said. "But we need more than technology; we need real business benefits."

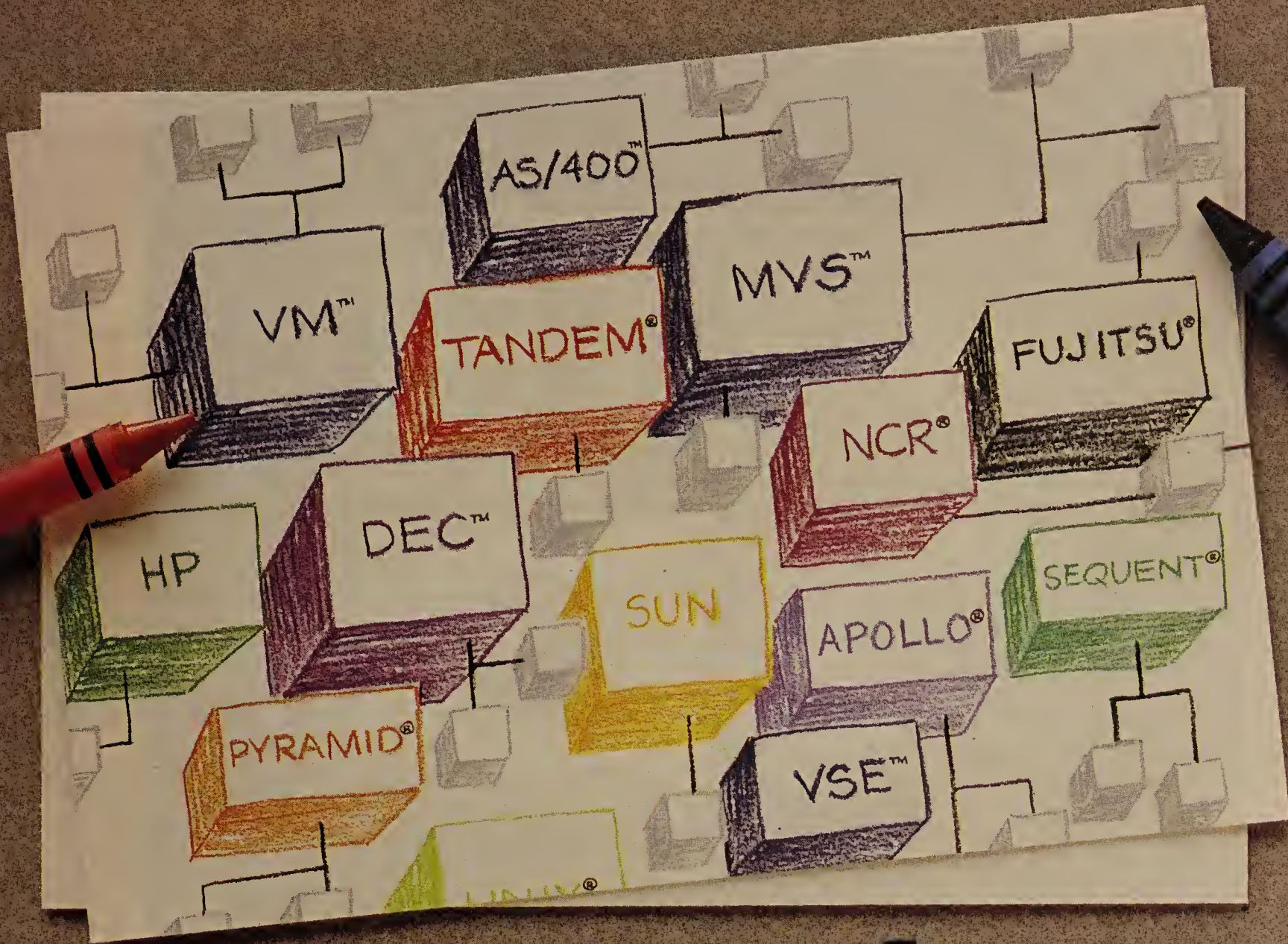
The company's technical managers determined that proprietary standards were a roadblock to conducting global business on an international scale. This was a convincing argument for du Pont's upper management, Pinson said. The company earns 44% of its \$35.5 billion annual revenue abroad, and 25% of its 146,000 employees are situated outside the U.S.

Du Pont decided to implement open systems standards in order to facilitate interconnection with the suppliers, customers and governments with which it conducts business internationally.

Pinson said one key to gaining management's support was to conduct a reverse market analysis to determine the current and future availability of OSI products.

Du Pont's staff polled vendors on pro-
(continued on page 84)

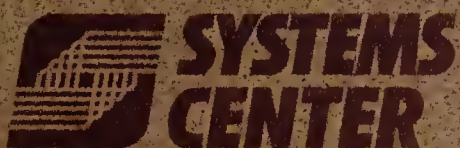
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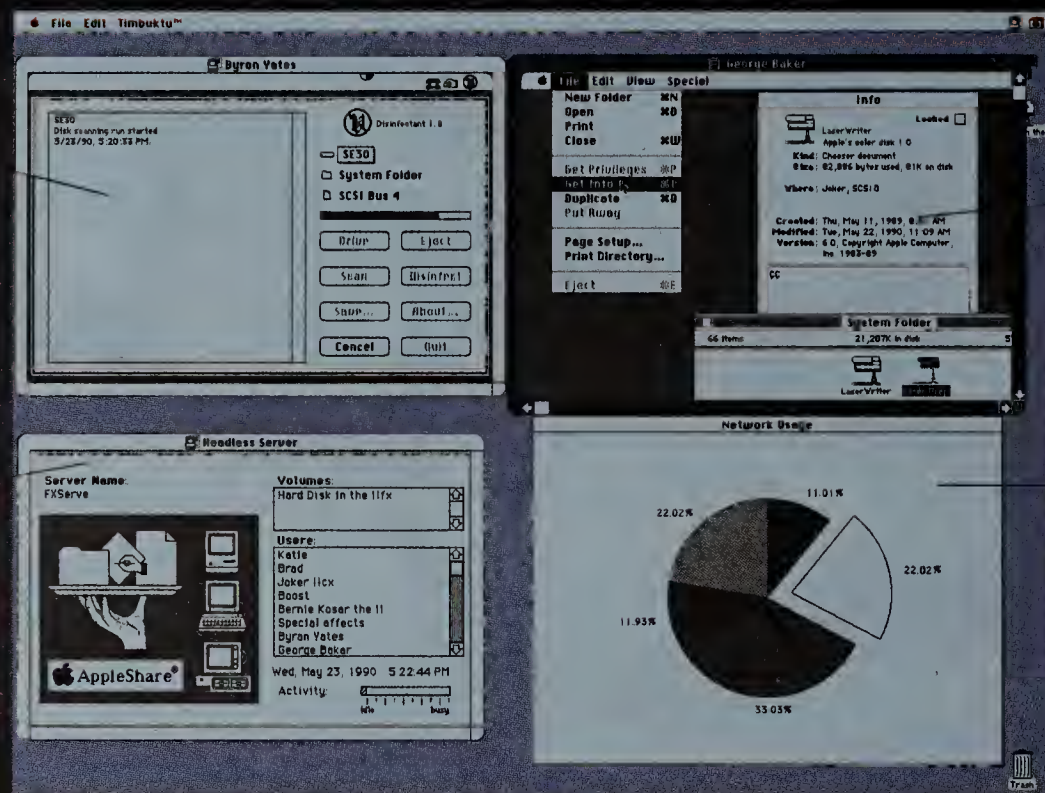
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INDUSTRY UPDATE

VENDOR STRATEGIES, MARKET TRENDS AND FINANCIALS

Worth Noting

Personal communications networks will "dramatically change the future of communications in America. Every firm with a major stake in telecommunications needs to be shaping their [networking] strategy now."

Edward Jungerman
President
Impulse Telecommunications Corp.
Dallas

People & Positions

Timothy Zerbic, formerly principal and vice-president of technology at Vertical Systems Group in Dedham, Mass., has left the research and consulting company to become vice-president of advanced technology at **Timeplex, Inc.**

In this newly created position, Zerbic will be responsible for assessing enterprise-wide technologies and market requirements, as well as identifying future trends.

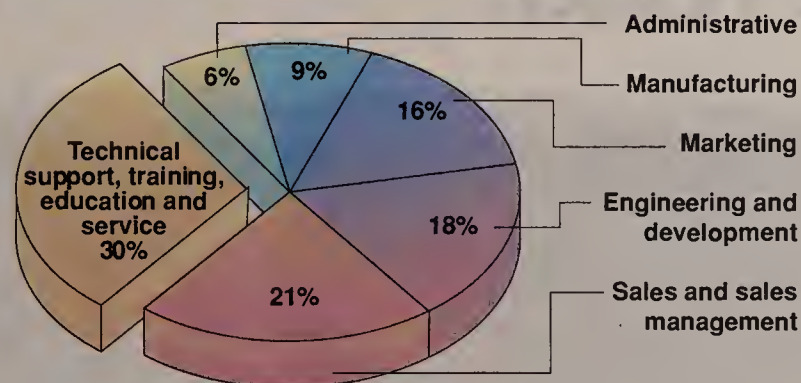
Nynex Corp. has announced the creation of Nynex Network Systems Co., a Brussels, Belgium-based company that will seek network business opportunities for Nynex outside the U.S.

Charles Many, formerly president of Nynex Mobile Communications Co., has been named president of Nynex Network Systems, a subsidiary of Nynex Worldwide Information and Cellular Services.

Alfred Boschulte, formerly vice-president of marketing and planning at Nynex, has been named president of Nynex Mobile Communications. In his new position, Boschulte will oversee the company's cellular telephone service, retail and installation operations in the New York/New Jersey metropolitan area. □

Help wanted: net service and support

Breakdown of areas in which vendors expect 1991 hiring increases



Figures are based on a survey of 290 vendors, including LAN and inter-networking equipment manufacturers.

GRAPHIC BY SUSAN J. CHAMPENY

SOURCE: AUSTIN-MCGREGOR INTERNATIONAL, DALLAS

OS/2 competition may turn budding relationship sour

IBM, Microsoft could divide over LAN Manager.

By Bob Brown
Senior Editor

WHITE PLAINS, N.Y. — IBM and Microsoft Corp.'s recent decision to split OS/2 development duties will not only have a significant impact on users, it could also pit the companies against each other and jeopardize their OS/2 LAN Manager relationship.

IBM's decision to develop a new "lite" version of OS/2 as a less memory-intensive alternative to its OS/2 Extended Edition could be a boon for users that need extra memory in network workstations and servers, analysts said.

But, they added, the product will compete with Microsoft's DOS-based Microsoft Windows 3.0 software, which is selling well as an operating system environment for client workstations in local-area networks, putting the companies on a crash course.

"If IBM and Microsoft find themselves competing head-to-head in the marketplace with Windows and OS/2, it will be increasingly difficult for them to continue to collaborate on LAN Manager and LAN Server," said Jeff Held, a principal at Ernst & Young's Network Strategies consulting practice in Fairfax, Va.

IBM's LAN Server network operating system is based on Microsoft's LAN Manager product.

Going separate ways

In recent weeks, both companies agreed that IBM would handle development of the next two major versions of OS/2 — a lite version for 16-bit machines, which IBM reportedly will call OS/2 Version 1.3, and a version for 32-bit processors.

IBM will position the lite version for use in both LAN client workstations and servers. OS/2 lite will be positioned as a less

memory-intensive replacement for OS/2 Extended Edition, which IBM tried to market as the client workstation operating system of choice.

"Up and down the line, our new version of OS/2 will be an improvement over the current one," an IBM spokeswoman said.

IBM's OS/2 lite will be 25%

IBM's OS/2 lite will be 25% faster than OS/2 and will require just 2M bytes of memory.

▲▲▲

faster than OS/2 Version 1.2 and will require just 2M bytes of memory so users have room to run larger applications, she said.

Michael Heylin, an analyst at Creative Strategies Research International, a Santa Clara, Calif., consulting firm, said IBM had no choice but to move forward with OS/2 lite.

"IBM has had so many objections from users and software developers to the resource requirements of [OS/2 Extended Edition Version 1.2] that they needed to address this issue," he said.

Microsoft, meanwhile, has retreated a bit from OS/2 and put more energy into Windows 3.0, including many improvements intended to make it more appealing as an operating system for client workstations on a LAN.

Microsoft also said it will develop a 32-bit version of OS/2 suited to run on Reduced Instruction Set Computing (RISC)-based servers and desktop computers.

(continued on page 12)

NTIA slams FCC's bundling proposal

Says plan flies in face of U.S. trade efforts to pressure PTTs abroad to unbundle services, gear.

By Ellen Messmer
Washington Correspondent

WASHINGTON, D.C. — The telecommunications advisory arm to the Bush administration has vehemently objected to the Federal Communications Commission's equipment bundling proposal, saying it threatens U.S. international trade negotiations.

The FCC's proposal to lift the current restrictions on bundling — whereby a carrier tariffs transmission services and telecommunications equipment together — has ignited a fire storm of controversy in Washington.

The FCC's domestic bundling proposal is being viewed by U.S. trade representatives as a major blunder that could undermine U.S. efforts to persuade foreign post, telegraph and telephone administrations to abandon bundling practices overseas.

"The FCC's bundling policy is not a particularly useful or constructive policy at this time," said Thomas Sugrue, deputy administrator for the National Telecommunications and Information Administration (NTIA).

Janice Obuchowski, NTIA's assistant secretary for communica-

tions and information, stated in NTIA filings with the FCC that the U.S. has long sought to foster open markets abroad. "Advocating the unbundling of customer premises equipment from net services has been a major component of such negotiations, which have resulted in some progress," she said.

In the 1968 Carterfone decision, the FCC invalidated an AT&T tariff prohibiting attachment of customer-provided devices on the switched telephone system. Subsequent decisions, such as the FCC's Second Computer Inquiry in 1980, have reinforced the regulatory concept that equipment should be separate from transmission services.

A recent study by the U.S. Department of Commerce stated that competition among domestic and foreign suppliers has been vigorous since Computer II.

But a bundling policy is one of the many sweeping regulatory changes affecting AT&T in the FCC's "Competition in the Interstate Interexchange Marketplace" notice of proposed rule-making. The FCC claims that (continued on page 12)

INDUSTRY BRIEFS

Novell buys Indisy. Novell, Inc. last week announced the acquisition of Indisy Software, Inc., a Toronto-based maker of electronic mail software that Novell has held a 60% stake in since July 1988. Indisy's operations will be melded into Novell's, and the company's 42 employees will be integrated into Novell's work force, with Indisy President A.L. Frank joining Novell as a sales and marketing consultant.

Indisy provides desktop-to-host E-mail applications that are compatible with the X.400 and Message Handling System protocols. Indisy's primary product is OfficeWare, a local-area network and host-based E-mail package that bridges personal computer LANs and offers connectivity to IBM mainframes via Systems Network Architecture links.


Indisy has announced a NetWare Loadable Module version of OfficeWare for NetWare 386 nets.

Codex to resell Larse gear. Codex Corp. last week announced that its systems integration division will become a value-added reseller of Larse Corp. channel service units (CSU) and data service units (DSU).

Codex, under its agreement with Larse, a Santa Clara, Calif., vendor, will provide the Larse offerings as part of custom bids for network products and services. Larse's T-1 Network Diagnostic System CSUs and Split-T fractional T-1 DSUs complement Codex's wide-area network products, a Codex spokeswoman said. The fractional T-1 capabilities of the Larse Split-T fractional T-1 DSUs, in particular, fill a gap in Codex's product line, she said. □

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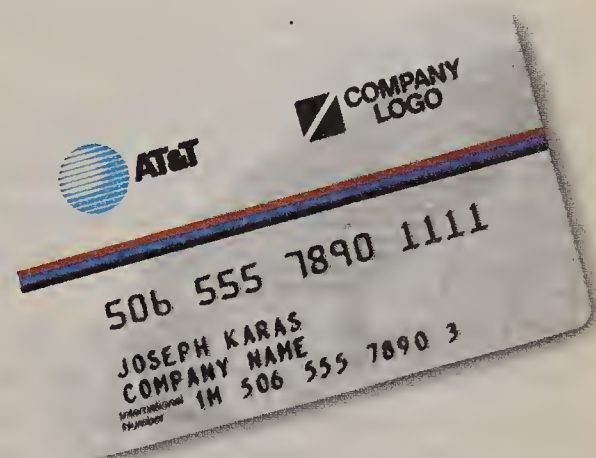
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Relationship may turn sour

continued from page 9

IBM and Microsoft said these products will be cross-licensed by both companies.

The two companies also reaffirmed their intention to converge Microsoft's LAN Manager LAN operating system software and IBM's LAN Server network

operating system.

Network Strategies' Held said the separation of development responsibilities is a big blow to OS/2.

Commanding position

"Without Microsoft pushing OS/2, IBM has a problem. Microsoft has a much more commanding position in the [microcomputer] systems software arena

than IBM does," Held said.

Jim Hammons, a vice-president at The Sierra Group, a market research firm in Tempe, Ariz., said the key for IBM will be getting software developers to come out with OS/2 applications. "There aren't that many yet," he added.

But some OS/2 applications have made it to market. Lotus Development Corp.'s Notes group-

ware software is an example, Creative Strategies' Heylin said. As more of these applications make it to market, IBM will stand a better chance of marketing OS/2 lite as a workstation operating system on a LAN, he added.

Impressive capabilities

John Dunkle, a vice-president at WorkGroup Technologies, Inc., a Durham, N.H., consulting

firm, said OS/2's communications capabilities are impressive enough that they could sway users with advanced net needs.

"The communications subsystem of OS/2 handles wide-area and local-area peer-to-peer communications," he said. "For users who want to move into cooperative processing environments between workstations, Windows is not robust enough." □

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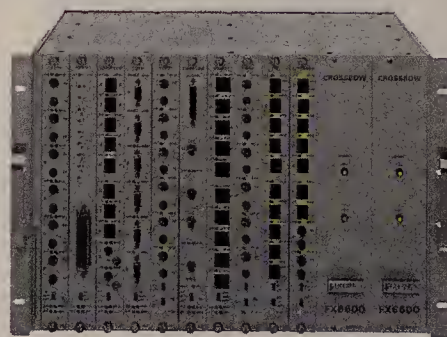
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Multiple Logical LANs in One Hub
20-, 40-, and 100-Port
Hub Capacity



NTIA slams FCC's proposal

continued from page 9

bundling will promote innovative packages for business customers. But behind the FCC's headlong rush toward bundling have been AT&T pleas for permission to bundle.

AT&T claims it is at a competitive disadvantage because US Sprint Communications Co. and MCI Communications Corp. engage in bundling surreptitiously.

But all three long-distance carriers, when pressed, admit that they offer bundled deals occasionally, even against company policy. Bundled equipment usually acts as a sweetener in a major services contract.

Both the FCC and Richard Firestone, chief of the Common Carrier Bureau, declined to comment on the bundling proposal and its effect on U.S. trade policy.

However, during an Aug. 2 hearing, Rep. Edward Markey (D-Mass.) pressed FCC Chairman Alfred Sikes on how he could reconcile the conflicts emerging in U.S. domestic and foreign telecommunications policy.

Sikes dismissed the importance of the bundling issue and pointed to other trade barriers, such as foreign equipment certification processes, as the real obstacles to free trade.

The conflict between NTIA and the FCC ironically comes at a time when U.S. trade negotiators from the U.S. Trade Representative's office have scored impressive gains abroad.

In a landmark agreement signed late in July between U.S. trade officials and the Japanese Ministry of Posts and Telecommunications, the Japanese agreed to require Nippon Telegraph and Telephone Corp. (NTT) to unbundle network channel terminating equipment from the provision of circuit facilities and institute separate cost-based charges for each offering.

Tom Thompson, vice-president of government and industry relations at General DataComm Industries, Inc., said the Japanese agreement would cover channel service units and data service units.

"Users in Japan now have a choice of where to get that equipment," Thompson said, noting that the freedom to select equipment is particularly important for users building global networks. □

"Come See Us at Interop, Booth #1916"

See The FAXNeT Form on Page 59

TELECOMMUNICATIONS

CARRIER SERVICES, CENTREX, CPE, WIRING SYSTEMS AND BYPASS

Worth Noting

AT&T last week said 106 customers have signed up for its Integrated Services Digital Network Primary Rate Interface service since the offering announced in April 1988.

Carrier Watch

AT&T last week cut from one hour to 30 minutes the time needed to restore 800 service for customers under its 800 Service Assurance Plan.

Announced in September 1989, the Service Assurance Plan is a free standard feature that gives users backup options if their AT&T 800 service is disrupted or the carrier takes longer than usual to provide the service. The plan is available to customers of AT&T's interstate, domestic 800 service, 800 Readyline, AT&T 800 MasterLine Service and Megacom 800 services.

In the event of a service outage, AT&T can provide temporary 800 Readyline service over any working telephone line, answer 800 calls with a recorded message or route calls to one of four AT&T 800 services the customer uses: domestic 800 service, 800 Readyline, AT&T 800 MasterLine Service and Megacom 800 services.

In a separate development, **A**T&T proposed rate hikes of an average 2.5% for a variety of its private-line services in a Sept. 30 filing with the Federal Communications Commission. The rate increases would cover AT&T's Accunet T1.5 service, T45 service, Accunet Spectrum of Digital Services, Voice Grade Private Line service and Dataphone Digital Service.

The increases are scheduled to take effect Oct. 12. According to a spokesman for AT&T, the proposed increases would boost the company's revenues by \$49.4 million a year. □

Interexchange carrier ISDN PRI charges

Charges	Carrier		
	AT&T	MCI Communications Corp.	US Sprint Communications Co.
PRI			
Onetime	\$3,000	\$3,000	\$2,000
Monthly	\$400	\$400	\$300
ANI			
Onetime	\$400	\$300**	\$200
Per number	2 cents*	1 cent	1 cent
Call-by-call service selection			
Onetime	None	\$250 per PRI	\$250 per PRI
Per change	None	\$200	\$200

* AT&T charges 2 cents per ANI for the first 60,000 numbers delivered and 1 cent for each additional number.

** Waived until further notice.

ANI = Automatic number identification

PRI = Primary Rate Interface

GRAPHIC BY SUSAN J. CHAMPENY

Ericsson to enhance PBX to support wireless phones

'Wireless PBX' technology due out in mid-1991.

By Anita Taff
Washington Bureau Chief

SAN DIEGO — Ericsson said recently that its MD110 Intelligent Network PBX will support both standard and wireless telephone sets in the future.

The so-called wireless private branch exchange technology, announced at the Tele-Communications Association, Inc. (TCA) conference here, is scheduled for commercial availability in mid-1991, pending approval from the Federal Communications Commission.

Ericsson will provide what it described as a radio exchange unit that enables the PBX to support wireless telephone sets. Users will also need radio cells, which would be placed throughout a building, to pass signals to and from the switch. The firm also introduced a wireless phone set that will work with the PBX.

According to Ericsson officials, customers most likely to benefit from the wireless PBX technology are those who have frequent personnel moves or occupy a building in which it is difficult to use traditional wiring, such as an older, historical site.

Ericsson is not the first company to market a wireless PBX system, but it claims it is the first to produce a system based on a microcell relay technology. That technology, which the company calls Cellular Telephone-3, allows for two-way digital communications, and supports encryption and a special handoff technique between base stations

to ensure that call signals aren't dropped.

The system takes advantage of Time Division Multiple Access technology, which divides bandwidth into multiple time slots. It also utilizes dynamic channel allocation, which enables the system to use the same channel to support different calls in adjacent cells.

Although wireless PBXs currently cost about twice as much as a traditional PBX, Guy Campbell, vice-president of marketing for Ericsson Business Communications, said the company hopes to put out a product that will cost only 40% more than traditional switches. At that price, users could recover the additional investment in two years from savings due to the reduction in building wiring changes, he said.

The new version of the MD110 will support Integrated Services Digital Network features such as automatic number identification. Future versions of the switch may also support data speeds of up to 640K bit/sec, but the initial versions will support voice only.

Customers could support up to 100,000 users on one PBX by installing multiple radio cells throughout a building or campus environment, according to the company. Each radio cell handles communications with the wireless handsets, can cover a 300-meter area and can be as much as 8 kilometers from the PBX.

The wireless PBX can deliver calls between wireless telephone
(continued on page 14)

Congress examines 900 service abuses

Reports of fraudulent use of 900 services may prompt Congress to implement strict guidelines.

By Anita Taff
Washington Bureau Chief

WASHINGTON, D.C. — Congress recently held a hearing on abuses by 900 service providers that may be the first step toward passage of legislation aimed at regulating the fledgling 900 industry.

The hearing, held by the House Subcommittee on Telecommunications and Finance, covered issues ranging from fraudulent conduct of 900 service providers to privacy concerns arising from the collection of callers' telephone numbers.

Rep. Edward Markey (D-Mass.), head of the subcommittee, said the hearing was the result of an increasing number of consumer complaints and reports of abuses by 900 service providers. The hearing also served as a sounding board for legislation introduced last month by Rep. Bart Gordon (D-Tenn.) to regulate 900 services.

While 900 providers serve many legitimate needs, such as supporting fund-raising efforts or allowing consumers to get stock quotes or respond to polls, some providers are taking advantage of customers, Markey said.

"These 900 services are used by some of America's most respected business institutions," Markey said. But he added that they are also used by "rip-off artists and other high-tech hucksters who aggressively pursue get-rich-quick schemes."

Abusive behavior by a minority of providers is hurting corporations that offer, or would like to offer, legitimate 900 services, Markey said.



Gordon echoed that sentiment, saying it is vital that regulation be put in place to control abuses.

Among the horror stories discussed at the hearing were 900 services that dupe consumers into calling to receive a prize or preapproved credit card. They are then instructed to call a second 900 number, which charges rates of as much as \$25 per minute, Markey said.

Other services are designed to entice children to call to win prizes, talk to cartoon characters or even Santa Claus. The young callers can run up thousands of
(continued on page 14)

WASHINGTON UPDATE

BY ELLEN MESSMER

Two more Tariff 12s. AT&T last week filed two more Tariff 12 Options with the Federal Communications Commission for a total of 72 Tariff 12 custom network arrangements to date. Option 71, which is for voice and data services over a three-year span for an unspecified user, is valued at \$25.27 million. Option 72, also a three-year voice and data offering, is valued at \$64.50 million, with two one-year renewal options that could bring the five-year value to \$107.81 million.

Input on PCN regulations. The Federal Communications Commission's request for comment on how it should regulate the personal communications network (PCN) services market — as yet unestablished in the U.S. although growing abroad — has resulted in a torrent of response from potential service providers, equipment vendors and users.

Because virtually no radio spectrum is available in the U.S. for PCN services, the FCC has said it may have to reallocate frequencies. The FCC is eyeing the 1.7- to 3.0-GHz frequency bands as suitable for new PCN services. But private microwave users in the petroleum and railroad industries currently licensed to use those bands feel their networks would be jeopardized by the FCC initiative on PCN. According to the American Petroleum Institute (API), "The impact of such a massive displacement would have a particularly severe impact on the operations and budgetary process of API's member companies." □

Congress examines 900 services

continued from page 13

dollars in charges on their parents' phone bills, Gordon said.

Under Gordon's bill, the Federal Communications Commission would be required to establish a regulatory system to curb 900 service abuses. The FCC would have 30 days after passage of the bill to begin a formal pro-

ceeding aimed at establishing that system.

The bill includes specific provisions the FCC would be expected to enforce. It would prohibit any interexchange carrier from offering service to a 900 provider that fails to give an introductory message outlining calling rates

and allowing a caller to hang up without incurring charges.

Additionally, customers would receive a written statement of their rights and obligations under the 900 service.

Gordon's bill would also include some requirements at the state level. Interexchange carriers would have to notify the state public utility commission of all 900 providers wishing to offer

service in that state. The bill also would require that callers be allowed to block access to all 900 numbers from their phone.

Under the bill, local carriers would also be prevented from terminating service to customers for failure to pay 900 charges.

But other witnesses disagreed with Gordon's claim that regulation is essential to the health of the 900 service industry.

Richard Firestone, chief of the FCC's Common Carrier Bureau, acknowledged abuses in the industry but warned "we should be cautious about stifling the growth of this burgeoning industry and the development of new and innovative services."

He said FCC Chairman Alfred Sikes will conduct a review of the 900 industry but some provisions of Gordon's bill may be impossible or impractical to enforce. For example, he said FCC regulation of 900 providers, which are not typically carriers, might usurp the authority of other agencies such as the Department of Justice, Federal Trade Commission and state regulators.

Under 17 not admitted

Additionally, Firestone said the FCC tried to prevent minors from calling dial-a-porn services but that decision is currently being reviewed by the U.S. Court of Appeals for the 9th Circuit.

A representative from AT&T, which offers an interactive 900 service known as MultiQuest, also had reservations about Gordon's bill. Patricia Lindblad, product manager for Multiquest at AT&T, said the carrier has already instituted its own procedures for preventing abuses.

She said 900 providers must comply with guidelines developed by AT&T in order to receive billing services from the carrier. According to Lindblad, AT&T has already terminated some service providers for violating these guidelines.

Customers that are dissatisfied with a 900 service may call a toll-free number provided by AT&T for help, Lindblad said. She contended that AT&T's own procedures, in conjunction with existing state and federal laws, are enough to regulate the 900 industry. ■

Ericsson PBX to support wireless

continued from page 13

sets or can switch calls from the radio unit to the terrestrial network. The company said it views the wireless PBX as a replacement for traditional switches and not as a bypass technology for local service.

Ericsson has applied to the FCC for permission to begin technical trials in Anaheim, Calif., and Washington, D.C. The company must get approval from the FCC before it can begin offering service since the agency regulates all nonwireline technology in addition to terrestrial facilities. The firm has announced plans to offer the wireless PBX in the Netherlands and Sweden, and has scheduled trials in those countries for later this year.

The company's new wireless handset, the Digital Cordless Telephone 900, is pocket-sized, has no antenna and weighs less than seven ounces. ■

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DATA COMMUNICATIONS

PRODUCTS, SERVICES, ARCHITECTURES, STANDARDS AND NETWORK MANAGEMENT

Worth Noting

MasterCard International, Inc.'s Banknet transmitted 16,000 images of credit card slips between banks during the last week of September. The company expects that number to reach 30,000 per week by year end.

Data Packets

Frontier Technologies Corp. is scheduled to announce today at the INTEROP 90 Conference and Exposition in San Jose, Calif., an X.400 product for use with Microsoft Corp.'s Microsoft Windows 3.0 that meets the International Standards Organization's 1988 Message Handling System specifications.

The product, Super-X.400 for Windows 3.0, lets users access any X.400 electronic mail package using the graphics-based Microsoft Windows interface.

For wide-area connections, the product supports the X.25 protocol and works with 802.3 Ethernet or 802.5 token-ring local-area networks. It is operating system-independent.

Super-X.400 for Windows, which is compatible with products based on the 1984 X.400 specification, includes a user agent complemented by user application software for composing, sending, forwarding, reading and managing messages. It also includes delivery timing services and an X.400 message transfer agent that supports functions such as message delivery to single and multiple recipients at one or more destinations.

The product is scheduled to ship in the first quarter of next year. Pricing will be announced during the fourth quarter of this year.

For more information, contact Frontier Technologies at 3510 N. Oakland Ave., Milwaukee, Wis. 53211, or call (414) 964-7543. **Z**

WORLDSPAN set to merge travel nets onto backbone

Company eyes X.25, SNA protocols over ALC.

By Paul Desmond
Senior Editor

ATLANTA — At a recent press briefing here, WORLDSPAN Travel Agency Information Services said plans are on track to merge its two airline reservation nets onto a high-speed backbone that will support links to LANs at travel agencies.

WORLDSPAN will pass up an airline protocol standard in favor of populating the backbone with X.25 or IBM Systems Network Architecture protocols, which will enable the company to support advanced distributed applications that make the most of local-area network resources.

WORLDSPAN was formed in February by the merger of Delta Air Lines' Datas II net and the PARS network, owned by Northwest Airlines, Inc. and Trans World Airlines. WORLDSPAN is jointly owned by those airlines plus Abacus Distribution Systems Pte, Ltd. WORLDSPAN serves travel agencies in 30 countries in North America, Europe and, via Abacus, the Far East.

This month, WORLDSPAN will break ground near here for a new data center that will house IBM's System/390 ES/9000, the vendor's latest mainframes. WORLDSPAN has also been working to enhance its distributed applications, which currently support IBM's PC LAN software but are expected to migrate to a version of the OS/2-based LAN Manager.

"When you put the solution on

the ground, you want the very best because the network is the key component of providing quality service," said Cal Rader, WORLDSPAN's chief executive officer.

Tom Hunt, vice-president of data processing and network communications, said the plan is to build a net that will support 30 million messages per day by 1993 and allow for growth at least until 2003. The company has not yet selected the vendor that will help determine the exact network configuration and provide networking equipment and services, but it has issued a request for information.

Rader said WORLDSPAN will likely select a systems integrator that can supply or procure all of the net components and support them at its locations around the world. Vendors will be charged with devising a strategy to support Datas II and PARS while developing the new WORLDSPAN net and providing a migration strategy to the new network.

The major change between the new WORLDSPAN net and its predecessors will be the switch from the Airline Link Control (ALC) protocol used by both Datas II and PARS to either X.25 or Synchronous Data Link Control. That will allow WORLDSPAN to support much more feature-rich applications, Rader said.

For example, ALC cannot easily support large file transfers
(continued on page 16)

Networking eases Asian Games communications

By Paul Desmond
Senior Editor

BEIJING, China — Results from last week's Asian Games here were relayed to journalists, visitors and athletes on-site and around the world by a network based on both centralized and distributed computing power.

During the games, which ended here yesterday, three Stratus Computer, Inc. XA2000 Continuous Processing Systems, an IBM mainframe and about 50 personal computers collected information on competition results and distributed them to about 400 personal computers dispersed throughout the Asian Games village and to news agencies worldwide.

On the first day of the games

alone, the network handled more than 280,000 inquiries, said Mark Leung, manager of business development for Stratus.

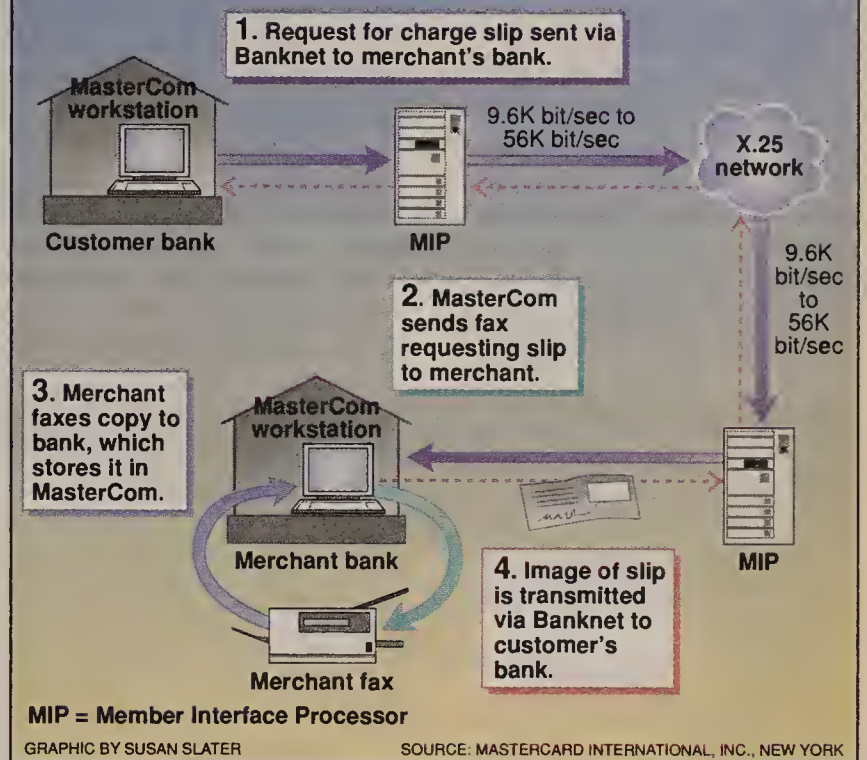
The Asian Games is the largest and most widely attended sports event in the Asia/Pacific region and the second largest in the world, dwarfed only by the Olympics.

During the games, personal computers located at stadiums, tracks, swimming pools and other event sites collected competition results, either by manual data entry or from electronic recording and scoring devices.

The data was then piped by 9.6K bit/sec X.25 links to a Stratus XA2000 Model 120 running an application dubbed the Results
(continued on page 16)

MasterCard enhances image net

Fax support speeds requests for disputed charge slips



MasterCard masters the fax possibilities

Firm adds facsimile support to image stations on BankNet to speed processing of disputed bills.

By Jim Brown
Senior Editor

NEW YORK — MasterCard International, Inc. has added a facsimile capability to imaging workstations on its Banknet network, enabling merchants to fax credit card charge slips to their banks in order to settle disputed charges more quickly.

MasterCard added fax boards to its microcomputer-based MasterCom imaging workstations on the network to satisfy requests from member banks that complained it took too long for merchants to mail copies of the charge slips. The slips help banks determine whether a cardholder or merchant is responsible for disputed charges.

The need to add facsimile support to MasterCom arose when merchants started implementing electronic draft capture (EDC) at the point of sale. EDC enables merchants to electronically record the details of a credit transaction. With EDC, only the cardholder and merchant retain paper receipts of the transaction.

Merchants that do not use EDC have to write out credit card slips that produce several carbon copies. The cardholder, the merchant and the merchant's bank receive copies of that slip. MasterCom was designed to enable the merchant bank to transmit an image of the sales transaction slip to the cardholder's bank.

"Many members complained to us," said David Africk, senior

vice-president of electronic services. "They said, 'You have a weak link. It's great that we can move an image from the merchant bank to the cardholder's bank.' " But, if the bank does not have a copy of the slip, it has to ask the merchant to mail one and wait for the copy to arrive.

Under MasterCard rules, a cardholder's bank must pay for all charges on the cardholder's account as they are incurred. If the cardholder disputes a charge when the statement arrives, the bank requests a copy of the charge slip from the merchant's bank. If the bank does not have a copy of the slip, it asks the merchant to supply one.

A copy of the slip must be supplied within 21 days. After that time, the cardholder's bank has the right to ask the merchant's bank to refund payment of the disputed charge, a process known as chargeback. If the process of locating, copying and mailing slips exceeds the three-week limit, both banks are faced with having to simultaneously settle a disputed charge with a cardholder and the chargeback with the other bank.

The initial MasterCom imaging system helped reduce the 21-day waiting period to seven days. Support for fax transmissions is expected to reduce that 21-day waiting period to just a few days, Africk said. Shortening delivery time helped reduce the amount of
(continued on page 16)

Networking eases communications

continued from page 15

Information System. The application tracked athletes' standings in each event and, by comparing those results to information stored in the personal computer data bases, determined any record-breaking performances.

Two other Stratus XA2000s supported the Electronic Information System (EIS), an application that distributed games results to personal computers and news agencies. That application supported 9.6K bit/sec links to the 400 personal computers in the village, to a radio paging service used to contact staff members and to the Chinese Xinhua News Agency.

Satellite links sent data from Xinhua to other foreign news services on demand, and a 300 bit/sec X.25 link provided a connection to a telex network operated by the Ministry of Post and Telecommunications in China, which in turn is part of a world-wide telex network.

An IBM 4381 mainframe was attached via a 9.6K bit/sec synchronous connection to one of the Stratus XA2000s. The mainframe supported a duplicate copy of all data stored on the XA2000s. It also ran the Personnel Information System, which stored all participants' and judges' applications as well as personal summaries of staff members associated with the Asian Games. That information was also available to personal computers users and news agencies via the EIS. **□**

WORLDSPAN set to merge travel nets

continued from page 15

such as those required to download new software to travel agency LANs. With the new network, WORLDSPAN will be able to offer such features.

Paul Halstead, WORLDSPAN's vice-president of distributed application development, said the company is leaning toward adoption of LAN Manager as its LAN operating system, although that decision has not been made yet.

"That seems to be emerging as one of the standard interfaces, so we could have either OS/2, DOS or even Unix devices operating on the same network using the same [application program interface],"

Halstead said.

The only other serious contender is Novell, Inc.'s NetWare 386. Both operating systems offer built-in features such as security that today have to be provided within each application.

Other computer reservation nets, including Covia Corp.'s Apollo and American Airlines, Inc.'s SABRE, are following a similar tack of using LANs in travel agencies.

Rader said WORLDSPAN is seeking to distinguish itself based on service, which includes supplying and supporting all of the components an agency needs for communications and automation.

In developing its applications, WORLDSPAN will likely adhere to IBM's Systems Application Architecture (SAA), Rader said. SAA defines a blueprint for how to write applications that are portable across IBM's most popular operating systems: MVS, VM, OS/400 and OS/2.

That will be important, given the company's direction to use distributed applications. These tap the power of travel agency LANs and minicomputers to more tightly integrate back office functions such as accounting with features provided by the reservation network.

The first of those products, which recently went into beta test, is code-named WORLDSPAN Res. 1.0. It works on IBM's PC LAN network and lets travel agents seamlessly switch between applications such as electronic mail — which they use to communicate with customers — and the PARS or, eventually, Datas II nets.

The product provides facilities intended to enhance user productivity, such as a cut-and-paste feature that lets users copy data from the host-based PARS or Datas II services to LAN- or workstation-based applications.

Other applications, such as the Integrated Reservation Imaging System (IRIS) will also be ported to a LAN. Today, IRIS resides on a stand-alone workstation and supports audio and full-motion video so travel agency customers can view promotional videos. Eventually, it will be ported to a LAN so that peripherals such as the CD-ROM equipment that stores the videos can be shared by multiple users. **□**

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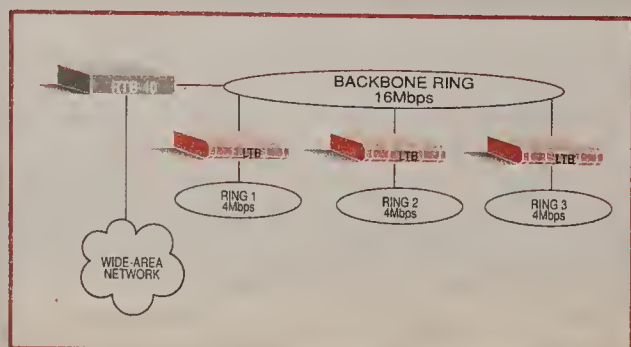
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MasterCard masters the fax possibilities

continued from page 15

chargebacks from an estimated \$200 million in 1989 to \$175 million this year, he added.

To support fax transmissions to MasterCom workstations, the company outfitted each MasterCom with a microcomputer housing four Intel Corp. Connection Co-Processor fax boards. The microcomputers are linked via Ethernet to the MasterCom workstations.

Under the current plan, a cardholder's bank requests a copy of a charge slip by transmitting an electronic mail request over Banknet to the merchant bank's host. If the merchant bank does not have a copy of the slip, the MasterCom station will generate a request and fax it to the merchant (see graphic, page 15). Upon locating the slip, the merchant will fax a copy back to the bank, which will scan it into the MasterCom node. The MasterCom device will also transmit a copy of the slip across Banknet's X.25 net to the requesting bank.

MasterCard will beta test MasterCom's fax support this month at an unnamed bank and is expected to make it available to its membership in the fourth quarter. **□**

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See The FAXNet Form on Page 59

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C. Please Answer ALL Questions, Sign & Date the Form.

1 Industry: (check one only)

- 01. ☐ Manufacturers (other than computer/communications)
- 02. ☐ Finance/Banking
- 03. ☐ Insurance
- 04. ☐ Real Estate
- 05. ☐ Healthcare Services
- 06. ☐ Legal
- 07. ☐ Hospitality
- 08. ☐ Retail/Wholesale Trade
- 09. ☐ Transportation
- 10. ☐ Utilities
- 11. ☐ Education
- 12. ☐ Process Industries (Mining/Construction/Petroleum Refining/Agriculture/Forestry)
- 13. ☐ Government State/Local
- 14. ☐ Government Federal
- 15. ☐ Military
- 16. ☐ Aerospace
- 17. ☐ Consultants (independent)
- 18. ☐ Carriers
- 19. ☐ Interconnects
- 20. ☐ Manufacturers (Computer/Communications)
- 21. ☐ VAR/VAD/Systems House
- 22. ☐ Distributor, Computer Related
- 23. ☐ Distributor, Communications Related
- 24. ☐ Other _____

2 Job function: (check one only)

- 1. ☐ Networking Management (Responsible for both voice & data)
- 2. ☐ MIS Management (VP, Dir., Department Head)
- 3. ☐ Corporate Management (Chairman, President, Owner, General Manager, CEO, CIO, VP)
- 4. ☐ Data Communications Management (Responsible for data only)
- 5. ☐ Telecommunications Management (Responsible for voice only)
- 6. ☐ Financial Management
- 7. ☐ Engineering Management
- 8. ☐ Consultant (Independent)
- 9. ☐ Other _____

3 What is the scope of your involvement in purchase decisions for Network/Communications products + services? (check one only)

- 1. ☐ Enterprise Wide (Organization/Subsidiary/Division)
- 2. ☐ Multi Enterprise (Consultants)
- 3. ☐ Department Wide

4 What is the total number of sites for which you have purchase influence?

- 1. ☐ 100+
- 2. ☐ 50-99
- 3. ☐ 20-49
- 4. ☐ 10-19
- 5. ☐ 2-9
- 6. ☐ 1

5 Your primary responsibility: (check one only)

- 1. ☐ Both Data + Voice
- 2. ☐ Data Networking Only
- 3. ☐ Voice Networking Only
- 4. ☐ None

6 Which transmission media do you use in your network: (check all that apply)

- Public:
- 01. ☐ Switched-Based (DDD, Wats, Megacom, etc.)
- 02. ☐ Leased Line (not including T-1)
- 03. ☐ T-1
- 04. ☐ Fractional T-1
- 05. ☐ T-3/SONET
- Private:
- 06. ☐ Broadband
- 07. ☐ ISDN
- 08. ☐ Satellite
- 09. ☐ Microwave
- 10. ☐ Fiber Optic

7 Is your network: (check all that apply)

- LOCAL AREA NETWORK
- 1. ☐ Local (within building)
- 2. ☐ Local (in a campus environment)
- WIDE AREA NETWORKS
- 3. ☐ International
- 4. ☐ National
- 5. ☐ Regional (several states)
- 6. ☐ Metropolitan

8 What is your network architecture? (check all that apply)

- 1. ☐ SNA
- 2. ☐ DECNET
- 3. ☐ OSI
- 4. ☐ GOSIP
- 5. ☐ MAP/TOP
- 6. ☐ TCP/IP
- 7. ☐ DCA (UNISYS)
- 8. ☐ OTHER _____

9 What is your LAN Operating System? (check all that apply)

- 01. ☐ 3COM (3+, 3+ open)
- 02. ☐ LOCAL TALK (APPLETALK)
- 03. ☐ BANYAN (VINES)
- 04. ☐ DCA (IRMALAN)
- 05. ☐ IBM (LAN Server)
- 06. ☐ IBM (PC LAN PROGRAM)
- 07. ☐ MICROSOFT (LAN MANAGER)
- 08. ☐ UNGERMAN BASS (NET/1)
- 09. ☐ NOVELL (NETWARE)
- 10. ☐ TOPS
- 11. ☐ PROTEON (PRONET)
- 12. ☐ OTHER _____

10 What is your LAN environment? (check all that apply)

- 1. ☐ 4M TOKEN RING
- 2. ☐ 16M TOKEN RING
- 3. ☐ ARCNET
- 4. ☐ ETHERNET
- 5. ☐ STARLAN
- 6. ☐ FDDI
- 7. ☐ LOCALTALK
- 8. ☐ OTHER _____

11 Which operating systems do you utilize? (check all that apply)

- 1. ☐ IBM DOS (VSE)
- 2. ☐ UNIX
- 3. ☐ OS/2
- 4. ☐ OS/2 Extended Edition
- 5. ☐ MVS
- 6. ☐ VM
- 7. ☐ VMS
- 8. ☐ XENIX
- 9. ☐ PICK
- 0. ☐ OTHER _____

12 Please indicate by vendor the number of mainframes/minicomputers installed in your network.

VENDOR	MAINFRAMES A	MINIS B
01. DEC		
02. IBM		
03. AMDAHL		
04. AT&T		
05. BULL HN IS		
06. NCR		
07. DATA GENERAL		
08. WANG		
09. HEWLETT PACKARD		
10. PRIME		
11. TANDEM		
12. UNISYS		
13. CONTROL DATA		
14. OTHER		

13 Please indicate by vendor the number of microcomputers/workstations:

- A. Presently installed in your network.
- B. The approximate quantity you plan to install in the next 12 months.

MICROCOMPUTER/ WORKSTATION/ VENDOR	PRESENTLY INSTALLED A	PLAN TO INSTALL NEXT 12 MONTHS B
01. PCs based on 80286 chip		
02. PCs based on 80386 chip		
03. PCs based on 80486 chip		
04. 8086/8088		
05. Macintosh		
06. RISC-based workstations		
07. UNIX-based workstations		

14 What is your planned PC standard? (check all that apply)

- 1. ☐ EISA
- 2. ☐ MCA
- 3. ☐ NUBUS (MACINTOSH)

15 For which areas outside of the U.S. do you have purchasing influence? (check all that apply)

- 1. ☐ Europe
- 2. ☐ Asia
- 3. ☐ South America
- 4. ☐ Australia
- 5. ☐ Middle East

16 Check ALL that apply in columns A and B

- A) I am presently involved in the purchase process for the following products/services:
- B) I plan to purchase the following products/services in the next 12 months:

Presently Involved A	Plan to Purchase B
01. <input type="checkbox"/>	<input type="checkbox"/> LOCAL AREA NETWORKS:
02. <input type="checkbox"/>	<input type="checkbox"/> Local Area Networks
03. <input type="checkbox"/>	<input type="checkbox"/> LAN Servers
04. <input type="checkbox"/>	<input type="checkbox"/> LAN Services
05. <input type="checkbox"/>	<input type="checkbox"/> Cables, Connectors, Baluns
06. <input type="checkbox"/>	<input type="checkbox"/> Bridges, Routers, Gateways
07. <input type="checkbox"/>	<input type="checkbox"/> UPS
08. <input type="checkbox"/>	<input type="checkbox"/> LAN Storage Devices
09. <input type="checkbox"/>	<input type="checkbox"/> COMPUTERS/PERIPHERALS:
10. <input type="checkbox"/>	<input type="checkbox"/> Micros
11. <input type="checkbox"/>	<input type="checkbox"/> Minis
12. <input type="checkbox"/>	<input type="checkbox"/> Mainframes
13. <input type="checkbox"/>	<input type="checkbox"/> Front End Processors
14. <input type="checkbox"/>	<input type="checkbox"/> Terminals
15. <input type="checkbox"/>	<input type="checkbox"/> Laptops
16. <input type="checkbox"/>	<input type="checkbox"/> Printers
	<input type="checkbox"/> Work Stations
	<input type="checkbox"/> Cluster Controllers

Presently Involved A	Plan to Purchase B
17. <input type="checkbox"/>	<input type="checkbox"/> SOFTWARE:
18. <input type="checkbox"/>	<input type="checkbox"/> Network Management
19. <input type="checkbox"/>	<input type="checkbox"/> Micro to Mainframe
20. <input type="checkbox"/>	<input type="checkbox"/> Network Security
21. <input type="checkbox"/>	<input type="checkbox"/> Call Accounting
22. <input type="checkbox"/>	<input type="checkbox"/> Distributed DBMS
23. <input type="checkbox"/>	<input type="checkbox"/> Communications Software
24. <input type="checkbox"/>	<input type="checkbox"/> Applications Software
25. <input type="checkbox"/>	<input type="checkbox"/> Network Operating Systems Software
26. <input type="checkbox"/>	<input type="checkbox"/> EDI Software
	<input type="checkbox"/> E-Mail Software

Presently Involved A	Plan to Purchase B
27. <input type="checkbox"/>	<input type="checkbox"/> DATA COMMUNICATIONS:
28. <input type="checkbox"/>	<input type="checkbox"/> Modems (over 9.6kbps)
29. <input type="checkbox"/>	<input type="checkbox"/> Modems (under 9.6kbps)
30. <input type="checkbox"/>	<input type="checkbox"/> T-1 Multiplexers
31. <input type="checkbox"/>	<input type="checkbox"/> T-3 Multiplexers
32. <input type="checkbox"/>	<input type="checkbox"/> Fractional T-1 Multiplexers
33. <input type="checkbox"/>	<input type="checkbox"/> Data Switches
34. <input type="checkbox"/>	<input type="checkbox"/> Matrix Switches
35. <input type="checkbox"/>	<input type="checkbox"/> Packet Switches
36. <input type="checkbox"/>	<input type="checkbox"/> Protocol Converters
37. <input type="checkbox"/>	<input type="checkbox"/> Network Management Systems
38. <input type="checkbox"/>	<input type="checkbox"/> Terminal Emulation Boards
39. <input type="checkbox"/>	<input type="checkbox"/> Facsimile Machines
40. <input type="checkbox"/>	<input type="checkbox"/> Diagnostic Test Equipment
41. <input type="checkbox"/>	<input type="checkbox"/> DSU/CSU
42. <input type="checkbox"/>	<input type="checkbox"/> Data Security
43. <input type="checkbox"/>	<input type="checkbox"/> Data Compression Equipment
44. <input type="checkbox"/>	<input type="checkbox"/> Network Adapter Boards
45. <input type="checkbox"/>	<input type="checkbox"/> Microwave
	<input type="checkbox"/> Messaging Software

Presently Involved A	Plan to Purchase B
46. <input type="checkbox"/>	<input type="checkbox"/> TELECOMMUNICATIONS:
47. <input type="checkbox"/>	<input type="checkbox"/> PBXs (over 1000 lines)
48. <input type="checkbox"/>	<input type="checkbox"/> PBXs (200 - 1000 lines)
49. <input type="checkbox"/>	<input type="checkbox"/> PBXs (under 200 lines)
50. <input type="checkbox"/>	<input type="checkbox"/> Key Systems
51. <input type="checkbox"/>	<input type="checkbox"/> Automatic Call Distributors
52. <input type="checkbox"/>	<input type="checkbox"/> Voice Messaging Systems
	<input type="checkbox"/> Video Teleconferencing Systems
	<input type="checkbox"/> SERVICES:
53. <input type="checkbox"/>	<input type="checkbox"/> Switched Voice
54. <input type="checkbox"/>	<input type="checkbox"/> Dedicated Leased Line
55. <input type="checkbox"/>	<input type="checkbox"/> T-1
56. <input type="checkbox"/>	<input type="checkbox"/> T-3
57. <input type="checkbox"/>	<input type="checkbox"/> Digital Data
58. <input type="checkbox"/>	<input type="checkbox"/> Packet Switched
59. <input type="checkbox"/>	<input type="checkbox"/> Centrex
60. <input type="checkbox"/>	<input type="checkbox"/> Central Office Lan
61. <input type="checkbox"/>	<input type="checkbox"/> Satellite
62. <input type="checkbox"/>	<input type="checkbox"/> On-Line Information
63. <input type="checkbox"/>	<input type="checkbox"/> ISDN
64. <input type="checkbox"/>	<input type="checkbox"/> EMail
65. <input type="checkbox"/>	<input type="checkbox"/> VSAT

17 Estimated value of networking equipment and services:

A: Which you helped specify, recommend or approve in the last 12 months?

B: Which you plan to help specify, recommend or approve in the next 12 months?

- A
- 1. ☐ \$100 million and over
- 2. ☐ \$50 - \$99.9 mill
- 3. ☐ \$25 - \$49.9 mill
- 4. ☐ \$20 - \$24.9 mill
- 5. ☐ \$10 - \$19.9 mill
- 6. ☐ \$5 - \$9.9 mill
- 7. ☐ \$1 - \$4.9 mill
- 8. ☐ \$500,000 - \$999,999
- 9. ☐ Under \$500,000

18 Estimated gross annual revenue of your entire company/institution: (check one only)

- 1. ☐ over \$10 billion
- 2. ☐ \$1 to \$9.9 bill.
- 3. ☐ \$500 to \$1 bill.
- 4. ☐ \$100 to \$499.9 mill.
- 5. ☐ \$50 to \$99.9 mill.
- 6. ☐ \$10 to \$49.9 mill.
- 7. ☐ \$5 to \$9.9 mill.
- 8. ☐ under \$5 mill.

19 Estimated number of employees for your entire corporation:

- 1. ☐ over 10,000
- 2. ☐ 5,000 - 9,999
- 3. ☐ 2,500 - 4,999
- 4. ☐ 1,000 - 2,499
- 5. ☐ 500 - 999
- 6. ☐ under 500

20 Which of the following ISDN products do you plan to purchase in the next 12 months? (check all that apply)

- 1. ☐ Basic Rate Interface Terminal Adapters
- 2. ☐ Primary Rate Interface Equipment
- 3. ☐ Voice/Data terminals
- 4. ☐ Voice-only terminals
- 5. ☐ Data-only terminals

21 From which of the following vendors will you consider buying your PBX/Central Office Switch? (check all that apply)

A PBX	B COS
A <input type="checkbox"/>	<input type="checkbox"/> AT&T
B <input type="checkbox"/>	<input type="checkbox"/> ALCATEL
C <input type="checkbox"/>	<input type="checkbox"/> ERICSSON
D <input type="checkbox"/>	<input type="checkbox"/> FUJITSU
E <input type="checkbox"/>	<input type="checkbox"/> HARRIS
F <input type="checkbox"/>	<input type="checkbox"/> HITACHI
G <input type="checkbox"/>	<input type="checkbox"/> ROLM
H <input type="checkbox"/>	<input type="checkbox"/> INTECOM
I <input type="checkbox"/>	<input type="checkbox"/> MEMOREX TELEX
J <input type="checkbox"/>	<input type="checkbox"/> MITEL
K <input type="checkbox"/>	<input type="checkbox"/> NEC
L <input type="checkbox"/>	<input type="checkbox"/> NORTHERN TELECOM
M <input type="checkbox"/>	<input type="checkbox"/> SAMSUNG
N <input type="checkbox"/>	<input type="checkbox"/> SIEMENS
O <input type="checkbox"/>	<input type="checkbox"/> STROMBERG-CARLSON
P <input type="checkbox"/>	<input type="checkbox"/> TOSHIBA
Q <input type="checkbox"/>	<input type="checkbox"/> OTHER _____

NETWORK WORLD

The Newsweekly of Enterprise Networking Strategies
An IDG Publication

(continued on next column)

LOCAL NETWORKING

PC AND TERMINAL-TO-HOST LANS, GATEWAYS AND MICRO COMMUNICATIONS PRODUCTS

Worth Noting

“As things stand now, only a limited amount of network management can be done from a central location. Users with LANs of any kind of size and importance should have an on-site net administrator or contract out for service.”

Lee Doyle
Manager of LAN research
International Data Corp.
Framingham, Mass.

Netnotes

Da Vinci Systems Corp. has begun shipping Da Vinci Names Services, a directory naming service that automates administrative functions, such as maintaining name lists, for multiple servers running Da Vinci eMAIL, a Message Handling System (MHS)-based electronic mail product. By updating name lists on multiple file servers across local-area networks, Names Services provides users of Novell, Inc.'s NetWare and other LANs with administrative capabilities similar to those in Banyan Systems, Inc.'s StreetTalk offering.

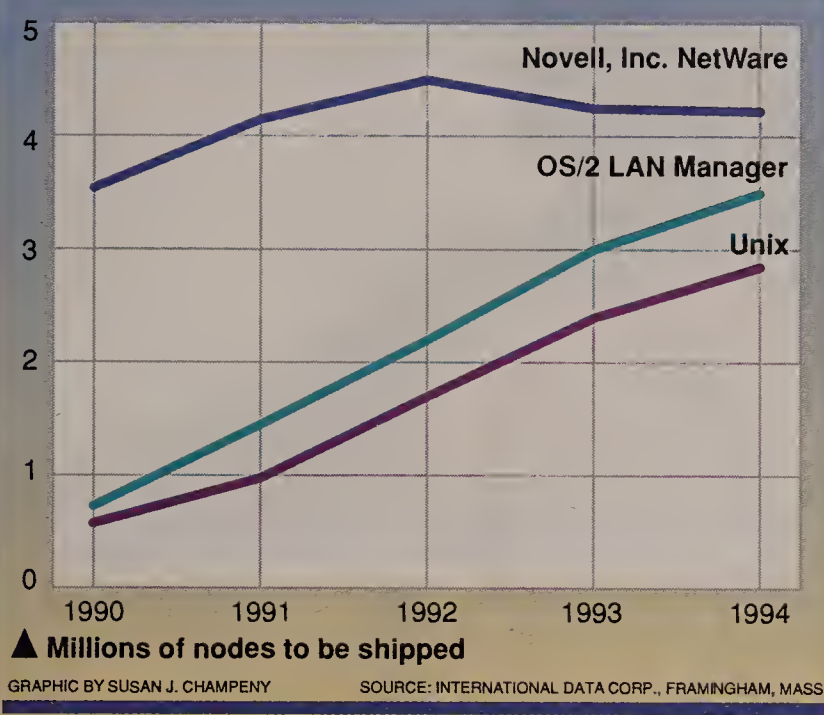
Names are maintained on a master list and updated automatically when servers communicate with remote servers. Administrators at remote sites can add or delete new names at their local server.

Da Vinci Names Services costs \$995 and supports one MHS routing host. Support for additional MHS internet hosts is available for \$495 each.

The company also announced a gateway that will allow users of Da Vinci eMAIL to exchange messages with Unix Mail users. The gateway, which is being tested, will use the MHS standard to communicate with systems supporting the Simple Mail Transfer Protocol.

For more information, contact Da Vinci Systems, P.O. Box 17449, Raleigh, N.C., or call (919) 881-4320. □

New players threaten Novell dominance



Microcom boards give LAN bridges 4-to-1 compression

Move boosts throughput over wide-area links.

By Charles Bruno
Assistant Managing Editor

NORWOOD, Mass. — Microcom, Inc. recently announced a board for its Microcom LAN Bridge (MLB) line that enables the devices to support 4-to-1 compression over wide-area links, significantly boosting the throughput of those lines.

In an unrelated move, the company announced 2-to-1 compression for X.25 interfaces that reside in its MLB6500 LAN bridge and rolled out a software upgrade that enables the bridges to support local and remote interfaces in the same unit.

By adding the 4-to-1 compression across its MLB line, which supports Ethernet and token-ring connections, Microcom is enabling users to pack more data into existing circuits, rather than adding lines to carry increased traffic loads.

The company previously offered 2-to-1 data compression across the MLB line, but that capability only supported compression on 64K bit/sec or slower circuits. The 4-to-1 compression now supports line speeds up to T-1 rates.

For example, on a 384K bit/sec fractional T-1 link, users could achieve throughput of 1.544M bit/sec, Microcom said.

The company singled out special hardware on its new PRV/4X compression card — which plugs into a Personal Computer AT-based MLB unit — as the key factor in its ability to boost the MLB's compression rates.

“Previously, microprocessors were not powerful enough to sup-

port compression for links significantly over 64K bit/sec. Our new T-1 compression is possible only because of our specialized hardware,” said Richard Sterry, vice-president of product marketing. He said the board features firmware that speeds compression.

Microcom user Sean Stanton, supervisor of technical services operations at Disclosure, Inc. in Bethesda, Md., said the enhanced compression capabilities will help the financial services concern handle traffic volume during peak loads.

“The 4-to-1 compression is nice, but what is really the key is its ability to support compression over high-speed lines. That’s go-

On a 384K bit/sec fractional T-1 link, users could achieve 1.544M bit/sec throughput.

▲▲▲

ing to be a boon for us,” Stanton said.

Disclosure’s main computing center in Bethesda communicates with an office at the Securities and Exchange Commission over a T-1 line.

The compression enhancements will enable the company to send more data over the link, he said.

The PRV/4X card will cost (continued on page 81)

Law firm moves its operation to PC LAN

New network will support 350 lawyers, cut costs, speed work flow and offer 24G bytes of storage.

By Maureen Molloy
Staff Writer

NEW YORK — In an effort to speed the flow of work and reduce costs, a large law firm here is installing a local-area network that will link 700 personal computers and six servers outfitted with a total of 24G bytes of disk storage.

All of the front office applications of the 350-lawyer firm of Proskauer, Rose, Goetz & Mendelsohn will be supported on the network, according to Frank Sforza, the firm’s MIS director.

“Our intention is to get everyone — lawyers, paralegals, secretaries and the accounting department — completely networked by the end of the year,” Sforza said. “This system will also allow regional offices to be hooked up and attorneys working at home to call up on-line.”

The 700 personal computers on the network will be supported by six AST Premium 486/25 Tower file servers — Intel Corp. 80486-based machines — running Novell, Inc.’s NetWare 386 operating system. Each server

will be configured with 2G bytes of duplexed disk storage, a total of 4G bytes of storage per server, and have 24M bytes of random-access memory, an amount generally found in minicomputers.

The network will also support seven communications servers,

“Our intention is to get everyone completely networked by the end of the year.”

▲▲▲

each of which will have 12 dial-in lines and 20 outbound links to Lexis, as well as a separate Westlaw server. Lexis and Westlaw are electronic libraries of statutory and court opinion files.

There is also a facsimile server and 12 other dial-out lines that can be used to access data bases (continued on page 82)

ALANTEC to offer support of SNMP on bridge line

FREMONT, Calif. — ALANTEC announced last week that it will support the Simple Network Management Protocol (SNMP) standard on its Multi LAN Switch (MLS) bridge line.

Support for the standard will enable net managers to use existing SNMP network management systems to monitor and control activity on local and remote local-area networks attached to the 40M bit/sec multiport Ethernet bridge.

The company is adding an SNMP agent to the bridge, as well as introducing complementary MultiLAN Manager software for third-party network management stations.

The SNMP agent will enable network administrators to monitor an MLS bridge from a centralized station and view usage statistics and alarms, obtain basic configuration data, and enable or disable specific MLS ports from any SNMP station, according to Steven Strom, manager of product marketing. Previously, ALAN-

TEC only offered its SMARTLAN Manager, an IBM Personal Computer AT-class network management station it introduced in 1989, to monitor, control and configure MLS-based equipment.

The company’s new MultiLAN Manager extends those features to an SNMP environment and provides the capability to remotely download new software configurations, reset or reboot an MLS, view MLS routing tables and initiate remote backup procedures.

Although the MultiLAN Manager is designed to run on any Unix-based SNMP network management station, ALANTEC said the software supports the graphical user interface and other features on Sun Microsystems, Inc.’s SunNet Manager, thereby facilitating integration of the two products.

SNMP agent software will be offered as a standard feature on all MLS bridges; the MultiLAN Manager will cost \$2,500. Both products are scheduled to be available in December. □



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MANAGEMENT STRATEGIES

MANAGING PEOPLE AND TECHNOLOGY: USERS GROUPS AND ASSOCIATIONS

Dialogue

Should companies allow managers to read the contents of electronic messages?

“No, that would be a violation of the basic right to privacy. Just because a person works in an electronic medium, their right to privacy is not nullified. People shouldn't read others' electronic mail without prior consent.”

Roy Pait

System administrator
Strand Lighting
Compton, Calif.

“No, managers do not have the right to read the contents of an E-mail message any more than they have the right to read mail sent on paper. While most E-mail contains company-specific data, it may well be confidential and not for anyone but the recipient. I understand the argument that says the manager may need to 'forward' damaged or undeliverable E-mail. Let them do it just as the mail room handles paper mail — read the address. If it is still undeliverable, return it to the sender or pitch it.”

Tom Kadlec

Vice-president
LAN operations
Citibank N.A.
New York

“You can make an argument for allowing managers to read E-mail messages. E-mail is a company tool that can very easily be abused and wasted by employees, and a company has a right to prevent that. But you also don't want employees to feel like they're in a prison system and have lost their rights. So the best answer to the problem is to allow managers to read E-mail messages but make it clear to employees that the policy exists. Then it's up to the employee to use the E-mail system.”

John Farago

Former information
systems director
CUNY Law School
Flushing, N.Y.
Currently academic dean
New York Law School
New York

Network World invites users to respond to future "Dialogue" questions through our Bulletin Board System (BBS). For information on how to access the BBS, see the Table of Contents on page 2.

Bandwidth demand forces users to mull new options

T-1 users examine solutions at user group meet.

By **Wayne Eckerson**
Senior Writer

SAN DIEGO — Bandwidth demands at many large companies are skyrocketing, forcing network managers to optimize existing T-1 private networks or migrate to higher speed T-3 circuits.

That was the consensus of network managers attending the third annual Independent T-1 Users Association (ITUA) here late last month.

About 50 people attended the two-day seminar, which explored a variety of communications topics including virtual private networks, migrating from T-1 to T-3, frame relay and integrating local and wide-area networks.

The ITUA, which also elected new officers at the meeting, has 70 members from user companies, carriers, equipment vendors and consultants.

Demand for bandwidth is increasing so rapidly because users are becoming more computer-dependent and less tolerant of network bottlenecks, according to Raymond Beavan, ITUA presi-

dent and manager of network services at LTV Steel Company, Inc. in Cleveland.

“People are busier than ever today and no longer have the patience to tolerate delays in response times,” Beavan said.

Conference-goers also pointed to a host of high-bandwidth applications that are forcing companies to expand the capacity of their networks.

These include videoconferencing, imaging and local network interconnection.

To satisfy user requirements, many managers are freeing up backbone bandwidth by off-loading some voice traffic onto virtual private networks (VPN).

Companies are loading up their T-1s to capacity and then using VPNs to handle extra volume during peak traffic periods, said Bob Heinze, senior principal specialist of network services at McDonnell Douglas Aerospace Information Services Co. in St. Louis.

Heinze was elected to serve as
(continued on page 22)

“Network managers need to be seen as hard-nosed guardians of top management's self-interests.

They can do that by measuring costs, tracking benefits and keeping a tight rein on the direction of the department. That's what builds credibility in the eyes of senior management.”

Jim Jewett

Cofounder, Telco Research Corp.



Net strategist offers insights to managers

Author James Jewett imparts advice on increasing credibility and improving working relationships.

Q&A James Jewett is the co-founder of Telco Research Corp., a supplier of telecommunications management equipment that was acquired by Nynex Corp. in 1986. Since then, Jewett has focused his energies on writing and speaking about entrepreneurship, leadership and telecommunications.

Jewett has authored four books and more than 75 articles, and is in great demand as a conference and seminar speaker.

While in San Diego last month to deliver a keynote address at the Tele-Communications Association, Inc.'s (TCA) annual conference, Jewett spoke with Network World's Senior Writer Wayne Eckerson about how network managers can increase their credibility within their organizations and enhance their relationships with vendors, end users and top management.

What are the biggest challenges network managers face in the coming decade?

They need to improve the linkages with top management, learn how to transcend the technology and focus on delivering benefits, not technology features.

For some reason, telecommunications managers have a professional obsession with the technical aspects of their job rather than the benefits they can provide their organizations. They also seem to have an inferiority complex about dealing with senior executives and front-line managers who really make the company go.

As a result, there is a good possibility that telecommunications will continue to be downsized and outsourced.

Is outsourcing a threat to network managers?

Absolutely. Outsourcing is an issue today primarily because network managers lack credibility with upper management. Senior executives don't think information systems [IS] network managers can control budgets and capital expenditures, as well as implement new technologies that deliver concrete benefits. They would rather trust a senior official at [Electronic Data Systems Corp.] who speaks their own language and knows how to add to the bottom line.

Senior executives are somewhat paranoid. It's easy for them to believe that network people don't understand how to make the company more competitive. Outsourcing firms feed on this paranoia, and they have the track record to show they can get results.

Do chief executive officers view networks as a utility or a strategic asset?

They see it as a necessary evil. Historically, CEOs haven't relied on technology to give them a competitive advantage. As a result, they are more likely to turn to other areas to boost productivity and competitiveness.

Even the so-called IS success stories — American Airlines [Inc.'s] SABRE network for example — were accidents. The company did not set out to take competitive advantage of network technology; it just evolved that way.

What steps can network managers take to gain more credibility within their organizations?

There are lots of things, but increasing credibility doesn't happen
(continued on page 22)

GUIDELINES

BY **ERIC SCHMALL**

The dangers of hiding behind doublespeak

A call comes into the network manager's office with a user complaining about a voice network outage. “I want to talk about yesterday's problem,” the user explains.

The manager replies, “Are you talking about the service event that occurred in the morning?”

“No,” responds the caller, beginning to show some annoyance, “I'm referring to the disruption in my department caused by all of the phones going dead for an hour and half during our most critical time of day.”

The manager draws a deep breath, “We are aware of a PBX anomaly that caused some call aberrations. Is this what you're describing?” The user now building to a full boil exclaims, “I want to know why the PBX failed and what you've done to correct it!”

The network manager coolly responds, “There was no failure; we did have a transient occurrence and I believe it breached some of our service-level parameters. But I'm sure it didn't qualify as anything more severe.”

This conversation shows a network manager attempting to reduce a serious problem into a nonissue by using “double-speak.” Doublespeak is the use of words or phrases that cloak reality in order to evade responsibility for events that may threaten a person's reputation or career.

The danger of doublespeak is that it can backfire. While doublespeak may enable a network manager to hide the truth for a time, it invariably arouses suspicion and damages trust
(continued on page 22)

Schmall is a network manager for an insurance holding company.

Dangers of hiding behind doublespeak

continued from page 21

between network managers and their firm's front-line managers and senior executives.

Doublespeak differs slightly but significantly from its cousin, the euphemism, which is a phrase that tries to protect the sensitivities of the listener.

Unfortunately, doublespeak pervades our society. Taxes are often referred to as "revenue enhancements," layoffs as "downsizing" and the poor as "economically unaffluent." The classic example of doublespeak is the Air Force attache who, during the Vietnam War, became so upset at the press that he said, "You always write

that it's bombing, bombing, bombing. It's not bombing. It's air support!"

All network managers should monitor their communications, both written and verbal, for evidence of doublespeak. Net managers are perhaps most tempted to use doublespeak when they have to report a system failure. Managers may use doublespeak to replace words such as downtime, outages and disruption. Phrases such as "service disjoints" or "negative functional periods" are clear examples of doublespeak that should be avoided.

As managers become vigilant about spotting doublespeak in their own language, they also learn to spot it elsewhere. This comes in handy when dealing with network vendors, carriers and other service providers. **Z**

Net strategist offers insights to managers

continued from page 21

pen overnight. You have to learn the basics and practice them over a long period of time. You can't expect to hit home runs.

It's important for network managers to explore the real objectives behind end-user requests. Too many managers simply provide dial-tone services without taking the time to understand user needs and goals. As a result, they may solve the wrong problems and miss excellent opportunities to provide a value-added service and make a significant impact on the company's operations.

What's the best way for net manag-

ers to discover end-user needs and goals?

Net managers could actually train their people for sales and spend six months out on the field or on the sales floor. It's not by chance that Sam Walton, chairman of Wal-Mart [Stores, Inc.], visits a thousand stores a year. He spends time bagging groceries or talking to people at the loading dock to find out about the operation, not going over the cash flow or profit/loss statement with the store manager.

Network managers have to key into what's important to CEOs and current business trends. Today, CEOs are looking at the Sam Waltons and others leading companies who are downsizing, speeding product development times, customizing
(continued on page 81)

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Bandwidth forces users to mull options

continued from page 21

the president of the ITUA in 1991.

Besides off-loading voice traffic to VPNs, managers said they are considering implementing frame relay to optimize their T-1 nets.

Frame relay is a streamlined version of X.25 packet switching that enables users to transmit packets of data between locations more efficiently. It is well-suited to handle bursty, high-speed data traffic typical of local network bridging.

According to William Flanagan, vice-president of Newbridge Networks, Inc. in Kanata, Ontario, who was a speaker at the conference, frame relay dynamically allocates bandwidth on a T-1 circuit. This capability enables users to optimize bandwidth on the backbone, especially when most of the traffic is between remote LANs.

While frame relay may extend the life of T-1 networks, attendees said they realize they will have to migrate to higher speed technologies, namely 45M bit/sec T-3.

"It is not a question of 'if' users will migrate to T-3, but 'when,'" said Michael Lefkowitz, director of business development at ADC Communications in Minneapolis and a session speaker.

Lefkowitz said T-3 circuits have been dropping in price, making them more attractive. Users that have between eight and 10 T-1s can typically cost-justify a T-3, he said.

While many users are eyeing T-3, few have embraced the technology. Less than 10 companies have implemented T-3 circuits to date, Lefkowitz said, and most of them are using the 45M bit/sec circuits for local access to backbone networks rather than in the backbone itself, he said.

Alan Mann, vice-president of business development for T3 Technologies and a session speaker, said T-3 circuits don't have extended superframe format capabilities, which enable managers to troubleshoot circuits without taking them out of service. In addition, vendors have yet to unveil suitable test equipment for T-3 circuits, he said.

Besides performance monitoring, many companies are concerned about bundling most or all of their T-1 circuits into a single T-3, said McDonnell Douglas' Heinze. A single cable cut could disable a company's entire network. He added that many carriers are encouraging users to consider implementing fractional T-3 as a way to ease into deploying full T-3 circuits. Fractional T-3 would give users route diversity and minimize the risk of a total outage, he said. **Z**

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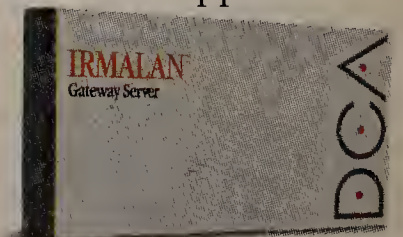
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Worth Noting

When AT&T cut over the Trans-Atlantic Telecommunications-8 (TAT-8) fiber cable in 1988, 80% of its private-line orders were for 56K or 64K bit/sec circuits, and 20% were for T-1s. On the TAT-9 cable, scheduled to bow in 1991, 80% of the orders are for T-1s, according to a spokesman for the carrier.

World News

AT&T recently announced plans to purchase an ownership stake in North Pacific Cable (NPC), an undersea fiber-optic cable from Japan to the U.S. that is scheduled to be cut over in early 1991.

AT&T declined to disclose how much bandwidth it is acquiring on the cable but said it is spending \$12 million.

NPC will sport a total capacity of 1,260M bit/sec, according to Pacific Telecom Cable, Inc., the Vancouver firm responsible for the American half of the cable.

The Japanese half of the cable is controlled by Tokyo-based International Digital Communications, Inc. and London-based Cable & Wireless PLC.

AT&T said it is acquiring capacity on NPC to enable its customers to establish diverse links to the Pacific Rim region over separate fiber-optic cables.

Currently, there is only one fiber-optic cable running from the U.S. to Japan.

That cable, the Hawaii-4/Trans-Pacific Cable-3 (Haw-4/TPC-3), was cut over in 1989.

According to an AT&T spokesman, bandwidth on Haw-4/TPC-3 is now scarce. New bandwidth on NPC could help AT&T meet user demands for fiber capacity in the Pacific. ■

IVANs expand service into new East German territory

Will offer alternative to weak public net services.

By Barton Crockett
Senior Editor

BERLIN — With the unification of East and West Germany now complete, leading international value-added network (IVAN) companies are expanding their presence in the former Communist stronghold.

By establishing nodes in East German territory or supporting interconnections with local public data nets, IVANs are offering users attractive communications options in an area with a weak network infrastructure.

The availability of IVAN services can let users minimize their reliance on unreliable East German switched and private-line services and can also make it easier to send data abroad.

The entrance of U.S.-based IVANs into what was formerly called East Germany also represents a marked change from the past, when export restrictions and a lack of demand kept all Western IVANs out of the area.

National governments and international trade groups, such as the Coordinating Committee on

Multilateral Exports, have prohibited or restricted exports of advanced network gear, such as packet switches, to East Bloc countries because of security concerns. But now that East Germany is part of a united Germany, these restrictions no longer apply.

A result of political changes

"While the Berlin wall was up and while we had a centrally planned economy, there was really no communications of this type allowed," said Martha Mostovych, manager of market development and communications at Rockville, Md.-based GE Information Services (GEIS), which recently opened its first East German node. "It was only as a result of political changes, and also changes in what is considered to be exportable, that we were able to go in."

Other U.S.-based IVANs moving into East Germany include the IBM Information Network and Infonet Services Corp., which is expanding into East German territory. (continued on page 26)

Puerto Rico puts for sale sign on state-run carriers

By Barton Crockett
Senior Editor

SAN JUAN — Puerto Rico is moving ahead with plans to sell off its state-owned local and long-distance carriers to private investors, further escalating movements by governments worldwide to raise funds and improve network services by privatizing carriers.

According to government officials, 14 companies have now submitted letters of intent to bid on purchasing all or part of Puerto Rico Telephone Co., a monopoly provider of local services, and Telefonica Larga Distancia de Puerto Rico, the dominant supplier of long-distance services.

The government has not released the names of the bidders or decided how much of each carrier will be sold off. Puerto Rican officials say they expect to receive final bids by November and to complete a full or partial privatization by next spring.

The government estimates that the local carrier, Puerto Rico Telephone, would be worth about \$3 billion, or roughly \$3,000 for each of its nearly one million lo-

cal access lines. Government officials expect that privatization will improve the performance of the carriers by injecting much-needed capital and new management.

Some U.S. users have complained about the quality of net services now provided by Puerto Rico's carriers.

Global trend

In looking to sell the two carriers, Puerto Rico now joins the ranks of other governments rushing to privatize national telecommunications systems.

The most recent entrant to this group is the government of Australia, where the ruling labor party late last month officially approved a plan by the ruling cabinet to sell off the national satellite service provider, Aussat Pty., Ltd. ("Australian gov't approves plan to open telecom mart," *NW*, Sept. 24).

Other countries now looking to privatize national carriers include Greece, Hungary, India, Malaysia, Mexico, Poland, Thailand, Uruguay and Venezuela, according to Eugene Laborne, vice- (continued on page 26)

Private U.S. international satellite systems

Company	Launch date	Service area	Capacity
Alpha Lyracom Pan American Satellite, Greenwich, Conn.			
PAS-1	1988	North America, Europe, Latin America and the Caribbean	24 transponders: 6 are Ku-band, 18 are C-band
PAS-2	1992	Approximately the same area as PAS-1	Undetermined but will be larger than PAS-1
PAS-3	1993	Pacific Rim countries and Asia	Undetermined but will be larger than PAS-1
Orion Satellite Corp., Rockville, Md.			
Developing a two-satellite system	First: 1992 Second: 1993	North America, Western Europe and portions of Africa	Both will have 34 Ku-band transponders
Columbia Communications Corp., Honolulu			
Columbia/tracking and data relay satellite systems	March 1991	North America, Europe and Northern Asia	24 C-band transponders

GRAPHIC BY SUSAN J. CHAMPENY

Competition heats up for VSAT services

New firms wield flexibility, other benefits INTELSAT will be pressed to match in private services sector.

By Maureen Molloy
Staff Writer

International telecommunications users can look forward to improved service and lower rates in the satellite services market as three U.S. companies gear up to compete against the International Satellite Organization.

Users and analysts said the newcomers are more flexible than INTELSAT and provide a number of benefits their largest market rival cannot. However, analysts said the service providers — Alpha Lyracom Pan American Satellite (PAS), Columbia Communications Corp. and Orion Satellite Corp. — will initially provide only dedicated services into private networks because they are restrained from offering links to public switched nets.

PAS has appealed to the Federal Communications Commission to overturn that restriction.

Tim Logue, a space and telecommunications analyst for the Washington, D.C. law firm Reid & Priest, said the availability of privately owned satellite systems could lead to lower costs, improved service and route diversity for users. He added that such private companies may also be easier to use.

"When you go through INTELSAT, you must approach the foreign signatory first, but a private company can operate like a domestic carrier that has international regions," Logue said. "Everything theoretically could be done under one roof."

PAS' Latin America manager,

Alvaro Toledo, said PAS provides the customer with easier access to the satellite than INTELSAT and also offers the benefits of one-stop shopping.

"PAS installs, maintains and operates the earth station as well as the satellite so the customer is dealing with one company," Toledo said. "INTELSAT, on the other hand, provides carriers only. So if a failure occurs, you've got to contact the carrier, who'll connect with COMSAT, which, in turn, will go to INTELSAT."

Clifford Thompson, a data services manager at Volvo GM Heavy

Privately owned satellite systems could lead to lower costs and improved service.

▲▲▲

Truck Corp. in Greensboro, N.C., and an early PAS user, said the company offered better rates and was willing to grant certain concessions to the user.

"PAS was cheaper [than INTELSAT] and more interested in servicing us, probably because we're one of their first private-line customers and they want to set a good example for other potential customers," Thompson said. "PAS was also flexible in its (continued on page 26)

Competition heats up for VSAT services

continued from page 25

installation structure and guaranteed us the possibility of increasing our line and channel speed if necessary, which is something INTELSAT wouldn't guarantee."

Thompson expects the private line to significantly reduce the company's long-distance service bills, although he would not detail those savings.

PAS launched its first satellite, the PAS-1, in 1988 and expects to launch a second within two years. Both will offer a broad range of coverage to regions across the world (see graphic, page 25).

Orion, a subsidiary of Orion Network Systems, Inc., a Rockville, Md., interna-

tional telecommunications services provider, expects to launch the first of two satellites for international corporate traffic by the end of 1993.

Columbia, a Honolulu-based satellite developer, will lease capacity next spring on 24 transponders it recently acquired on two National Aeronautics and Space Administration satellites. The two satellites cover both Eastern and Western Europe, the U.S. and the northern Pacific Rim.

Although Columbia doesn't anticipate leasing capacity directly to end users, making the transponders available to carriers should provide more end-user options.

PAS has asked the FCC for a waiver on restrictions outlined in a 1985 ruling that originally gave alternative service providers permission to compete with INTELSAT.

However, that ruling, known as the Separate Systems Decision, also prohibited alternative satellite service providers from beaming traffic onto public switched networks. By contrast, almost 90% of INTELSAT's business comes from routing satellite traffic onto public switched nets, according to the FCC.

PAS is arguing that INTELSAT has demonstrated its resilience to competition and that such competition serves the public interest. The restriction, PAS attorneys said, works against U.S. interests in developing a competitive telecommunications marketplace. According to PAS attorney Henry Goldberg, "Creating a more competitive telecommunications environment would enhance U.S. trade and economic interests." ■

IVANs expand service into East Germany

continued from page 25

tory by supporting local access via Datex-P, Germany's national public data network.

Until recently, Datex-P was operated solely by the West German carrier Deutsche Bundesposte Telekom and was only available in West Germany. But now that East and West Germany are officially united, Deutsche Bundesposte is merging with East Germany's national carrier and Datex-P is being expanded into East German territory.

Mostovych said that GEIS cut over its first East German node, in Berlin, in August of this year.

She said GEIS is planning to cut over a node in Chemnitz later this month, as well as nodes in Dresden and Leipzig by early November.

Mostovych added that GEIS' nodes will be interconnected by terrestrial lines. She said these lines took longer to install than satellite circuits but will be better suited to supporting applications that respond poorly to satellite propagation delay.

Among the companies that plan to use GEIS East German nodes are Handelsblatt, Sueddeutsche Zeitung and Axel Springer Verlag, according to a GEIS spokesman. Mostovych said that, thus far, no American companies have signed up to use GEIS East German nodes.

Mostovych also said that, to her knowledge, the only other foreign IVAN with nodes in East German territory is IBM, with its IBM Information Network. An IBM spokesman said the company is opening Information Network nodes in 14 East German cities, including Chemnitz, Dresden, East Frankfurt, Leipzig, Magdeburg and Suhl. Leased lines will connect these nodes back to a central node in Berlin.

Infonet Services Corp. plans to support local access in Chemnitz, Dresden and Leipzig by January of next year via the Datex-P network, according to a spokeswoman for the El Segundo, Calif.-based IVAN.

Among the American companies that plan to use Infonet's East German service are *The Los Angeles Times* and *The Boston Globe*, the spokeswoman said. ■

Puerto Rico puts for sale sign up

continued from page 25

president of operations at Nynex International Co. in White Plains, N.Y. The government of New Zealand has already sold off its state-owned carrier, and the government of Argentina plans to complete the sale of its state-owned carrier to two international consortiums this month.

"It seems like every day another one pops up," Laborne said. "You've really got to seriously wonder whether there's enough capital out there to handle all of this. There's only a finite number of organizations that would be able to buy a telephone company."

Nynex Corp. recently announced plans to bid on an ownership stake in the Mexican carrier Telefonos de Mexico, S.A. de C.V., in conjunction with the Canadian network giant BCE, Inc. and a Mexican investment firm. Nynex also recently formed a new business unit, Nynex Network Systems Co., whose sole mission is to bid on foreign telephone companies and to pursue cellular, cable television or network operations abroad. ■

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First Look

New software supports 3270 over Telnet protocol

Xyplex recently introduced a software option that enables its terminal servers to support IBM 3270 sessions over an Ethernet with an IBM mainframe.

The company's **TN3270** option allows users attached to Xyplex's Maxserver terminal servers to establish a Transmission Control Protocol/Internet Protocol Telnet session with an IBM host and set up a 3270 emulation session over the Telnet link.

Users need to load the optional TN3270 software on their terminal server, and TCP/IP software must be running on the IBM host.

In the past, Xyplex users could establish Telnet sessions with IBM hosts running TCP/IP software but they could not access those hosts in 3270 mode.

TN3270 is available now. Support for eight users costs \$595, while support for 16 users costs \$1,190.

Xyplex, 330 Codman Hill Road, Buxborough, Mass. 01719; (508) 264-9900.

Newbridge unveils 4M bit/sec token-ring interfaces

Newbridge Networks, Inc. recently announced 4M bit/sec token-ring interfaces for its 3100 MainStreet family of bridge/routers, which previously supported only Ethernet local-area networks.

The 3100 MainStreet routes data supporting the Transmission Control Protocol/Internet Protocol and Novell, Inc.'s Internetwork Packet Exchange (IPX) protocols. It will be enhanced to support token-ring source routing and source routing transparent.

The new token-ring interfaces are offered in three versions. A single token-ring interface costs \$4,500, a version with a single token-ring interface and one wide-area network port supporting speeds up to T-1 costs \$7,000, and a card with a token-ring interface and two wide-area ports costs \$8,000. The interfaces are available now.

Newbridge Networks, Inc., 593 Herndon Pkwy., Herndon, Va. 22070; (703) 834-3600.

(continued on page 29)

SynOptics unveils Ethernet routers for LattisNet hubs

Boards support distributed routing concept.

By Tom Smith
Senior Editor

MOUNTAIN VIEW, Calif. — SynOptics Communications, Inc. recently introduced two interface boards that integrate local Ethernet routing functions into its LattisNet System 3000 local-area network hub.

The interfaces support a decentralized routing approach, with routers dispersed throughout hubs in a large LAN internet-work, rather than deploying large, multiport routers that support multiple LANs from a single location.

SynOptics said the decentralized routing approach improves users' flexibility to incrementally add capacity to their net and to segment the network into small subnets for performance or security reasons.

The LattisNet 3383 and LattisNet 3384, which reside in a System 3000, connect the hub to an Ethernet LAN or other hub via thick Ethernet or fiber-optic cabling, respectively.

The routers are based on the IGS router recently introduced by cisco Systems, Inc. The two companies announced an agreement to develop the products last April.

Consequently, the new LattisNet routers can also interoperate

with cisco Systems routers, which could be positioned as high-level routers capable of passing traffic over wide-area networks or providing access to specialized mainframes.

Both products are network-layer routers that support a variety of protocols, including Apple Computer, Inc.'s AppleTalk, Digital Equipment Corp.'s DECnet, Novell, Inc.'s Internetwork Packet Exchange (IPX) and Xerox Corp.'s Xerox Network Systems. They filter data at a rate of 15,000 packet/sec and forward it at 5,000 packet/sec for any packets that are 64 bytes or larger.

The routers also support cisco Systems' Interior Gateway Routing Protocol, which enables them to exchange messages with other SynOptics and cisco Systems routers on the net to dynamically build routing tables that direct packets over the least costly path.

The single board used in cisco Systems' IGS has been redesigned to fit into the System 3000. SynOptics also enhanced its existing management software to support the new routers.

The LattisNet 3383 communicates with Ethernet nodes in the System 3000 over the backplane of the hub. It also has an attach-

(continued on page 29)

Board lets users fax data from within applications

HILLSBORO, Ore. — Intel Corp.'s Personal Computer Enhancement Operation (PCEO) recently announced a second-generation personal computer facsimile board that allows users to transmit faxes from within applications.

SatisFAXtion, a board that resides in Industry Standard Architecture (ISA) or Micro Channel Architecture (MCA) personal computers, also comes standard with a V.22bis modem that operates at 2,400 bit/sec.

SatisFAXtion features a What You Print Is What You Fax capability, whereby users can send a fax simply by entering the same keystrokes they would use to print a document. When the computer prompts the user for the name of the output device, users key in the number of a particular fax machine. Any application that supports output to a printer can be used.

For applications such as file

transfer, users can utilize an on-board V.22bis modem, which supports Microcom, Inc.'s Microcom Network Protocol Classes 1 to 5 for error correction and data compression.

SatisFAXtion's predecessor, the Connection CoProcessor, required users to exit an application to send a fax.

Alternatively, they could run one of roughly 60 applications that support the Communicating Application Specification (CAS), which allows users to send a fax from within that application.

SatisFAXtion is available now. For ISA personal computers, it costs \$499; for MCA computers, it costs \$549.

Connection CoProcessor, which will be phased out, costs \$890.

Intel PCEO can be reached by writing to C03-7, 5200 N.E. Elam Young Pkwy., Hillsboro, Ore. 97124, or by calling (503) 629-7354. □

Data Switch's UniLAN products at a glance

Product	Function	Price
UniLAN ChannelConnect Communicator	Ethernet-to-IBM host link	\$18,000
UniLAN Universe Communicator		
Model I	Token-ring hub	\$16,000
Model II	LAN router	\$23,000
Model III	Link to matrix switch	\$30,000
UniLAN Intelligent Wire Center Hub	Token-ring hub	\$1,500 per eight-port hub; \$41,700 fully configured
UniLAN Routers		
UniLAN 4100	Links LANs running various protocols	\$7,000
UniLAN 4200	Links LANs to FDDI backbone	\$15,000
UniLAN 4/16 Network Interface Cards		
4M bit/sec for ISA	Link personal computers to	\$750
4M or 16M bit/sec for ISA	token rings	\$1,000
4M or 16M bit/sec for EISA		\$1,495

EISA = Extended Industry Standard Architecture
ISA = Industry Standard Architecture

GRAPHIC BY SUSAN J. CHAMPENY

SOURCE: DATA SWITCH CORP., WILTON, CONN.

Data Switch intros bevy of LAN wares

UniLAN offerings give Ethernet and token-ring users access to existing mainframe resources.

By Tom Smith
Senior Editor

SAN DIEGO — Data Switch Corp. recently introduced a family of local-area network products, including offerings that link Ethernet and token-ring LANs to IBM hosts.

The new products will help users integrate their LANs into the data center for more effective LAN management and control.

The UniLAN product family, introduced at the Tele-Communications Association, Inc. show here, includes the UniLAN ChannelConnect Communicator, a device that links an Ethernet to an IBM mainframe channel.

Data Switch also rounded out its UniLAN line with routers, LAN hubs and token-ring interfaces made by Proteon, Inc.

Those LAN hubs and routers are packaged as options to the new UniLAN Universe Communicator, which links token-ring LANs to mainframes.

Ethernet-to-host link

The new ChannelConnect Communicator is a stand-alone device that links a single Ethernet to an IBM host channel. Both the mainframe and devices on the Ethernet must support the Transmission Control Protocol/Internet Protocol.

The UniLAN ChannelConnect

Communicator supports an integral Data Switch channel extender. With the channel extender, users can connect two ChannelConnect Communicators at distances of up to 20 kilometers, or 12.4 miles, using fiber-optic cabling. Such a configuration allows one remote Ethernet to access a host at channel speeds.

Matrix switch link

The unit can also be connected to a matrix switch, in which data

The UniLAN ChannelConnect Communicator links an Ethernet to an IBM mainframe channel.

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from the Ethernet can be switched between multiple mainframe channels supported by the mainframe. This allows for redundancy and rapid recovery in the event of a failed channel.

Data Switch's UniLAN ChannelConnect Communicator is priced at \$18,000.

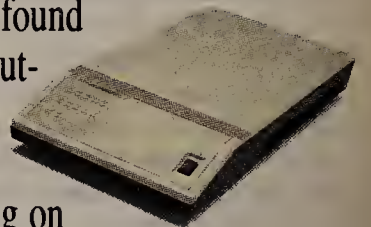
Data Switch also announced (continued on page 29)

NEC modems keep information moving as if your life depends on it.



In a 911 emergency, to risk a communications breakdown is to risk a life. So if you don't want to take any chances, make sure your modem can handle the pressure in a crisis.

In Florida, NEC's I Series Intelligent Chassis System is now helping coordinate the life-saving efforts of Lake County's 911 services. The county chose the system after tests found NEC's I-Chassis modems outperformed others. And they've proved their round-the-clock reliability by being on the job there for more than a year without a single failure.



Since NEC modems are designed to rapidly and accurately transmit huge volumes of data, Lake County's 911 operators can now quickly pinpoint accident locations, provide traffic instructions, find patient medical records, and dispatch back-ups when needed. And because NEC's Dual Modem Card links 911's control center to NEC Dial-up Modems in remote locations, Lake County feels it has found the best data networking solution attainable.

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the system's built-in flexibility eliminates product obsolescence by making it easy to add, mix, and match other chassis and data communications devices as network requirements change.



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Data Switch intros bevy of LAN wares

continued from page 27

the UniLAN Intelligent Wire Center Hub, which houses as many as 16 token-ring media access units (MAU), each of which connects a maximum of eight personal computers to token-ring LANs operating at 4M or 16M bit/sec. The MAUs, which support shielded and unshielded twisted-pair cabling, are an OEM version of Proteon's Series 70 Intelligent Wire Center.

Data Switch has enhanced the product to report management information from Proteon's TokenView network management system into Data Switch's TotalNet network management system, which then displays the data on a single console. The DOS-based personal computers running the two management systems will be connected via an RS-232 interface.

Control of the LAN hub and MAUs via TotalNet will enable Data Switch users to integrate management of LAN devices into the TotalNet system, which is also used to manage Data Switch channel extenders and matrix switches.

Data Switch is selling the eight-port UniLAN hubs for \$1,500. A fully configured UniLAN Intelligent Wire Center Hub, including chassis and 16 eight-port MAUs, costs \$41,700.

Rolling out routers

In addition, Data Switch announced its UniLAN Router line. The UniLAN 4100 router supports four local- or wide-area connections and can be used to route traffic based on protocols including TCP/IP, Novell, Inc.'s Internetwork Packet Exchange (IPX), Digital Equipment Corp.'s DECnet and Xerox Corp.'s Xerox Network Systems. Based on Proteon's p4100+ Bridging Router, the UniLAN 4100 costs \$7,000.

Another router, the UniLAN 4200, based on Proteon's p4200 FDDI Router, links as many as 10 LANs to a Fiber Distributed Data Interface backbone. It supports the same protocols as the UniLAN 4100 and costs \$15,000.

Data Switch enhanced the Proteon routers to be managed via TotalNet.

Finally, Data Switch will market Proteon's ProNET-4/16 personal computer token-ring interfaces. The interfaces, which Data Switch calls UniLAN 4/16 Network Interface Cards, link a personal computer to a token-ring LAN.

The cards are offered in three versions: one links Industry Standard Architecture (ISA) personal computers to a 4M bit/sec LAN; another links ISA computers to 4M or 16M bit/sec LANs; and the third links Extended ISA computers to 4M or 16M bit/sec LANs. The adapters cost \$750, \$1,000 and \$1,495, respectively.

The final product included as part of the introduction was the UniLAN Universe Communicator, a stand-alone device offered in three versions that links token-ring LANs to mainframes. The Universe Communicator is a LAN hub that physically attaches to a Token-Ring Interface Coupler card residing in an IBM front-end processor.

Model I of the Universe Communicator is configured to support a maximum of 16 eight-port UniLAN MAUs for token-ring LANs, giving hub-attached devices access to host resources.

Model II has the same capabilities as Model I, but it also includes a UniLAN router for routing applications so that token-ring nodes supported by the hub can com-

municate with users on other LANs.

Finally, Model III comes with all of the capabilities of a Model II unit but also includes a hardware interface to a Data Switch matrix switch. In this configuration, the matrix switch would reside between two Universe Communicators, which are linked to the switch via fiber at a maximum distance of five kilometers. The matrix switch provides redundancy and rapid recovery for failed channels or token-ring connections.

Models I, II and III will cost \$16,000, \$23,000 and \$30,000, respectively.

All of the new products are expected to be available by the end of this month.

Data Switch can be reached by writing to 141 Danbury Road, Wilton, Conn. 06897, or by calling (203) 926-1801. □

SynOptics unveils Ethernet routers

continued from page 27

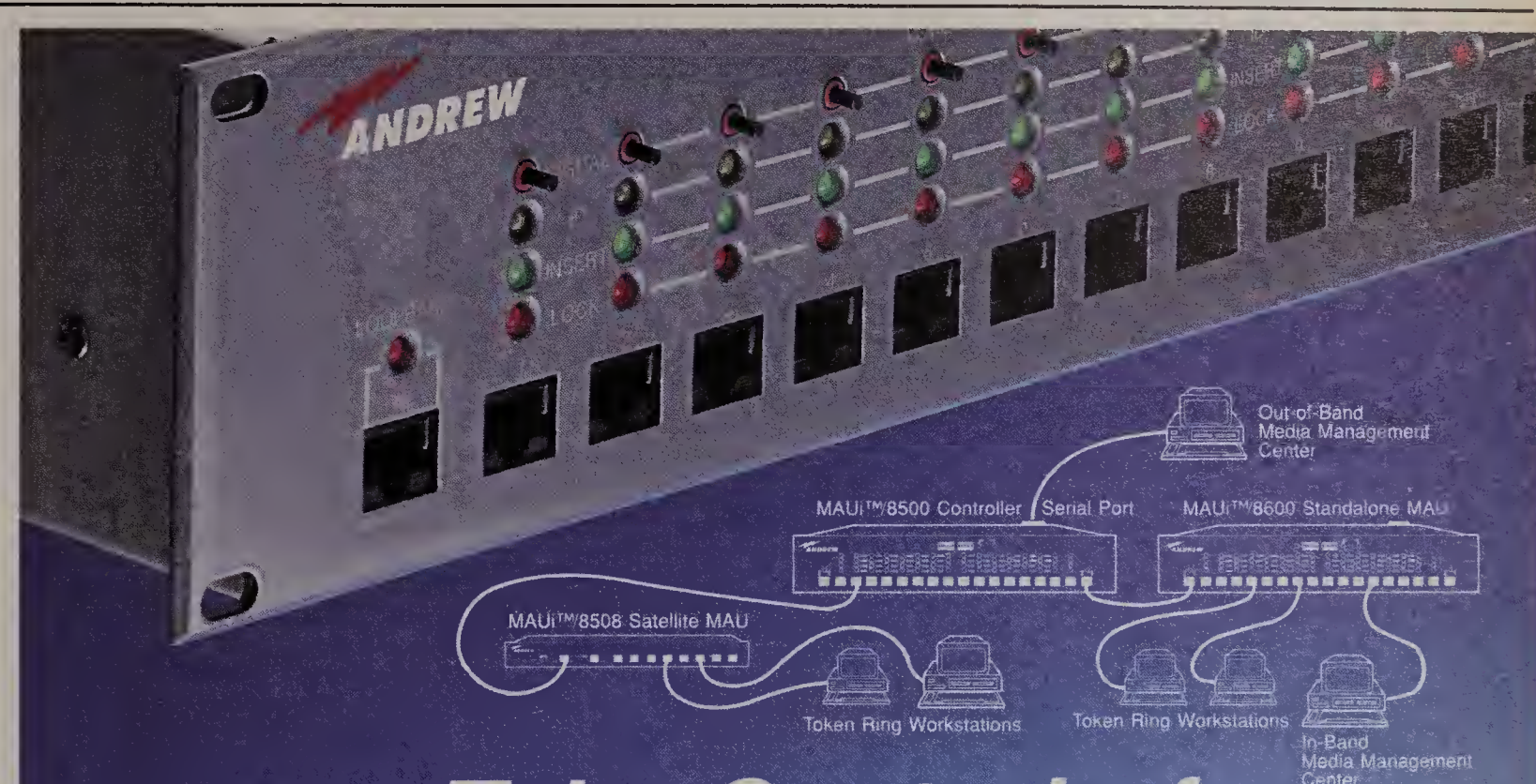
ment unit interface port that enables the router to be linked to another LAN or System 3000 hub using thick Ethernet cabling at distances less than 500 meters, or 1,640 feet. Users could also utilize this port to connect to 10BaseT Ethernet over unshielded twisted-pair cabling using a transceiver. Distance limitations with 10BaseT are 100 meters, or 328 feet.

The LattisNet 3384 performs the same function as the 3383 but uses a fiber-optic interpeater port for connection to other Ethernet nodes. This increases the distance limitation to 2,000 meters, or just over one mile.

The routers have a Simple Network Management Protocol (SNMP) agent developed by Cisco Systems, and the System 3000 also has an SNMP agent. Both agents can communicate with SynOptics' SNMP-based Expanded View software running on a DOS-based personal computer. The router can also be managed using a proprietary version of Expanded View, which also runs on a DOS personal computer. The latter has been enhanced to support the routers.

Both of the new routers are expected to be available in December. The LattisNet 3383 will cost \$6,395, while the LattisNet 3384 will cost \$6,795.

SynOptics can be reached by writing to 501 E. Middlefield Road, Mountain View, Calif. 94043, or by calling (415) 960-1100. □



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First Look

continued from page 27

StarNine links Microsoft Mail, InBox Plus to MHS-based E-mail systems

StarNine Technologies, Inc. recently announced **Mail Link MHS**, an electronic mail gateway that connects Microsoft Corp.'s Microsoft Mail and Sitka Corp.'s InBox Plus mail program to Message Handling System (MHS)-based mail systems.

Mail Link MHS allows users of Microsoft Mail and InBox Plus to exchange mail and files with all Novell, Inc. and Action Technologies, Inc. MHS messaging systems.

These messaging systems include Action Technologies' Coordinator and WordPerfect Corp.'s Office.

It will also connect E-mail systems that run on Apple Computer, Inc. Macintoshes to other mail systems that have gateways into MHS, including Alcom Corp.'s LanFax, Banyan Systems, Inc.'s VINES and Enable Software Corp.'s Higgins Mail.

With Mail Link MHS, Macintosh and personal computer users can exchange mail directly without having to learn additional E-mail commands.

For personal computer applications that cannot read Macintosh files, a utility is included for extracting the various parts of a Macintosh file.

A single copy of Mail Link MHS can bridge all Microsoft Mail or InBox servers on a network to MHS-based nets.

The cost of Mail Link MHS is based on the number of Microsoft Mail or InBox us-

ers accessing the gateway.

Prices range from \$195 for 10 users to \$995 for 100 users.

The product is expected to be available in December.

StarNine Technologies, Inc., 2126 Sixth St., Berkeley, Calif.; (415) 548-0391.

RAD Data unveils fractional T-1 DSU/CSU, compression device

RAD Data Communications, Ltd. recently introduced a fractional T-1 data service unit/channel service unit (DSU/CSU) and a data compression device.

The new DSU/CSU is offered in two versions: a basic version, **FCD-1M**, and a

more advanced version, **FCD-1X**. Both models terminate a full T-1 line but enable users to utilize bandwidth in multiples of 56K or 64K bit/sec.

The FCD-1M supports only a consecutive group of DSOs, which constitute a T-1 link; the FCD-1X, by contrast, allows users to send their data over nonconsecutive DSOs, such as 1, 5, 10 and 14. Users that do not have a complete T-1 often need to send data over nonconsecutive DSOs as specified by their carrier. In addition, the FCD-1X gives users a supervisory port to connect an ASCII terminal or personal computer for management functions. The basic FCD-1M supports management only from a front-panel display.

FCD-1M and FCD-1X are each offered in versions with one and two wide-area links. Prices for the FCD-1M are \$1,250 and \$1,500, respectively. Prices for the FCD-1X are \$1,750 and \$2,000, respectively. They are available now.

RAD also introduced its Trimlink-800 data compression device, which functions like a multiplexer but actually compresses data, by a ratio of up to 4-to-1, on each of its eight RS-232 data terminal equipment channels. Other multiplexers that perform compression do so only on the wide-area network link.

Trimlink-800 supports two wide-area connections at speeds up to 19.2K bit/sec. It can be linked to leased or dial-up lines, and it supports the V.32 standard for modulation at 9.6K bit/sec. Trimlink-800 costs \$7,000 and is available now.

RAD Data Communications, Ltd., 151 W. Passaic St., Rochelle Park, N.J., 07662; (201) 587-8822.

Intellicom offers 10BaseT Ethernet in Quick-Net 3000 plus offering

Intellicom recently announced the **Quick-Net 3000 plus**, a local-area network wiring hub that supports the IEEE 802.3 10BaseT standard for running Ethernet over telephone wiring.

The Intellicom Quick-Net 3000 plus series also offers users network interface adapters and transceivers.

The hub supports connection of shielded or unshielded twisted-pair wiring and is compatible with both AT&T Premises Distribution System (PDS) and the IBM Cabling System.

The Model 212 Wiring Concentrator regenerates signals for broadcast to attached host devices, workstations and other concentrators, and signals the occurrence of collisions to the devices involved. The concentrator supports wiring runs of up to 330 feet between concentrators or workstations.

The Model 401 Transceiver allows a 15-pin coaxial-based attachment unit interface to connect into the Model 212 wiring hub.

The company's TPAIR-8T and TPAIR-16T network adapters include an on-board transceiver for connection of workstations and servers to a dual twisted-pair Ethernet network.

The Model 212 Wiring Concentrator costs \$999, and the Model 401 Transceiver is priced at \$129.

The TPAIR-8T Network adapter card is priced at \$325, and the TPAIR-16T Network Adapter Card costs \$449.

All of the products are currently available.

Intellicom, Inc., 20415 Nordhoff St., Chatsworth, Calif. 91311; (818) 407-3900. □

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X.32 (Dial X.25)

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Laidlaw, the waste management experts, found their business picking up by putting a network we designed to work across North America.



See The FAXNeT Form on Page 59

OPINIONS

VENDOR SALES TACTICS

BY WILLIAM JOHNSON

Dodging sales pitches that start at the top

With the recent increase in competition for your business dollars, service vendors are turning to professional sales consultants to give their sales forces a competitive edge. The main goal is, of course, to take control of the sales process away from users and give it to salespeople.

Today's vendor sales force is being trained to start the sales process at the top — typically with the executive vice-president or above. They do this fully realizing that most executives will refer them to the person with ultimate responsibility for the negotiations. This approach, however, allows the salespeople to return to the powers that be if they get an answer they don't like from the person they were told to contact.

Consider the case of a major New England-based insurance company. We'll call them the Big Insurance Co. Big Insurance wanted a vendor to manage its local-area networks and provide services such as installation, wiring, subcontractor management, network diagnostics and microcomputer maintenance.

When IBM was asked to bid on the project, its salespeople bypassed Jim, Big Insurance's assistant vice-president of net-

Unfortunately, the net design giveaway is little more than smoke and mirrors.

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work services who had called them, and instead met with Nick, the company's executive vice-president of field operations. Nick listened and was impressed with their approach. He thanked them for their efforts and asked them to meet with Jim, who would be making the evaluation.

IBM then had the assigned sales representative meet with Jim. But after two months of negotiations, IBM felt that it was going to lose Big Insurance's network management business.

So the original sales team called once again on Nick. "We're getting down to the wire in the negotiations," one of the salespeople said. "We've put our team together to manage your network installation and support. We've cut our price to the bone in order to help you with your cost control."

"We really need a decision now if we are to meet your deadline for the installation of your first LAN in Atlanta. I know that you don't want to go before the board of directors and explain why a multimillion-dollar project is behind schedule because you tried to save a few thousand dollars."

"If we can reach an agreement now, I'll provide network design at no cost if you let us manage the network for you."

Unfortunately, this net design giveaway is little more than smoke and mirrors. Any hardware vendor would be happy to design the network for free because it means that they will dictate your shopping list.

However, in this case, the tactic worked. Nick gave verbal authorization for IBM to get the contract.

Avoid this problem by deciding from the start who is going to negotiate for your company. Always refer salespeople to the proper person in your organization and make it clear that they are not to go over the head of the person *you* have selected.

Stand firmly behind the person who is negotiating for your company. If vendor salespeople ask for a courtesy visit because they are concerned, let them know that you will be happy to meet with them *after* a vendor has been selected.

A win-win arrangement is your goal. Whoever gets your service business wins some very lucrative revenue. What you are trying to do is to see that the revenue isn't *too* lucrative. ■

Johnson has held a number of management positions in the network/computer service industry over the past 20 years.

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EDITORIAL

Get deserved recognition with NW's User Excellence Awards

Time is running short for you to get involved in *Network World's* most important editorial project of the year.

We're still accepting applications for our Sixth Annual User Excellence Awards — the first awards designed to honor users for their innovative applications of network technology.

Network World was founded 4½ years ago with one simple idea in mind: Networking helps companies do business better, faster and smarter. We believed networking would give U.S. companies a competitive edge in the global marketplace.

Today we believe that more than ever. In issue after issue over the years, we've chronicled the efforts of aggressive, inventive organizations that have used networking to cut costs, grab market share and move ahead of the competition.

And each year, we've honored the best of the best of these users with our User Excellence

Awards. Through these awards, we applaud organizations that have become more productive and more responsive to customer needs by taking advantage of the power of networking.

Now you have the opportunity to get into the running for our Sixth Annual User Excellence

SIXTH ANNUAL User Excellence Awards

Awards. All you need to do to enter is submit a 250- to 500-word abstract explaining how networking has helped your organization achieve its strategic business goals.

For instance, has networking helped launch new offerings or differentiate your products and services from those of competitors? Has networking helped you reduce design or manufacturing delays and bring products to market more quickly? Have network technologies helped you

build more productive relationships with customers and business partners? If so, we want to hear from you.

We don't accept nominations from vendors — this is strictly a user-driven competition. We can't spotlight your company unless you let us know what you've done with networking.

Remember, the size of your network isn't important — it's how networking has helped you achieve your objectives that matters.

What is important is that you act quickly; we're only accepting entries for a limited time.

You can fax your entry to us at (508) 820-3467 or mail it to: Special Projects Editor, *Network World*, 161 Worcester Road, Framingham, Mass. 01701. Be sure to include your name, company name, address and telephone number.

Don't delay. Get the recognition you deserve for your innovative networking efforts. ■

OPINIONS

INTEGRATION

BY JAMES HERMAN

Voice and data are heading off in different directions

Throughout the 1980s, one of the top planning goals for most net managers was the physical, organizational and technological integration of voice and data networking. It was common wisdom that enterprises should migrate toward a single network utility that handles all forms of communications.

However, it does not appear to be working that way. The technologies of voice and data communications are *not* moving closer together.

For example, narrowband Integrated Services Digital Network technology is finally starting to get off the ground but ISDN use is not replacing local-area network use. As a wide-area technology, ISDN will mainly be used for voice. Instead, users are implementing specialized services such as frame relay and Switched Multi-Megabit Data Service (SMDS) to meet their LAN interconnection needs.

Voice and data communication procurement strategies are also moving in different directions. Strategic purchasing deals from the major long-distance carriers have led many organizations to give up private T-1 voice networks.

There is no indication, however, that data networking is moving to the carriers. In fact, data traffic volume on T-1 backbones is increasing as more net managers use networks of personal computers and workstations. The result is that data traffic is beginning to dominate the T-1 backbone. Most T-1 backbones carried 80% voice traffic only a few years ago. Today it is more like 60%.

If this trend continues, we may see more bandwidth devoted to data than voice on corporate, private T-1 networks. Also, if predictions on the use of fiber-

optic LANs and imaging technologies are correct, data networking bandwidth could skyrocket. With the advent of fractional T-1 and further movement of voice to the public networks, data-only T-1 backbones are now a distinct possibility.

Many enterprises have accomplished organizational integration, uniting previously separate voice and data networking departments and appointing a communications director who is responsible for both technologies.

Most organizations, however, continue to maintain a clear

The field of voice communications is stable, a perfect choice for outsourcing. Data networking is still changing radically.

▲▲▲

departmental division between voice and data, even though each may report to a common director.

In addition, most of the management systems in use today are specialized for either voice or data. The integrated management system that can handle both voice and data is still years in the future.

The current infatuation with outsourcing is threatening to become the latest wedge driving voice and data apart. Few organizations are contemplating a total divestiture of information technology assets such as the one Eastman-Kodak Co. initiated. Instead, most are thinking about handing over only a portion of their networking operation — and the portion most often considered is voice.

The field of voice communications is stable and mature, a perfect choice for outsourcing.

Data networking, on the other hand, is still changing radically and growing rapidly. Forging a long-term data network outsourcing deal that will promote continued technical innovation and still be relevant in three years is very difficult. Far fewer companies will outsource data than will outsource voice.

In the long run, data networks may replace voice networks by treating voice as another form of data. Whether this is integration or subjugation is debatable. If broadband networks develop quickly, then digitized voice will be a drop in the bucket compared with the data volumes generated by new broadband applications such as three-dimensional imaging.

Even so, as the specifications for broadband ISDN begin to firm up, we'll probably find that it is less than the all-purpose communications solution it's being billed as — technologies that aren't expected for five more years always look great.

In the 1990s, the strategic issue will be the integration of computing and data communications, not the integration of voice and data. As network speeds approach bus speeds, the difference between a multiprocessor and a collection of processors on a high-speed LAN becomes slight.

The distinctions between network and system management are beginning to blur as net management techniques are used to manage distributed systems. Application developers must design the next generation of business systems to take advantage of networks and use the new distributed processing paradigm.

The computer is certainly a communications device, and it must interface with the installed voice network. Computers will control voice processing, and voice messages will be stored and manipulated by computers. For the foreseeable future, however, voice and data technology, management and provisioning appear to be heading in different directions. ■

Herman is a principal at Northeast Consulting Resources, Inc., a Boston consulting practice that focuses on strategic management of information technology.

LIKE ALLIGATORS IN A SWAMP, unforeseen problems can really put the bite on a communications operation. Many managers find themselves wrestling with these networking reptiles every day.

If you've survived an "alligator attack," share it with our readers by calling Susan Collins, assistant features editor, at (508) 820-7413, or fax your idea to us at (508) 820-3467. Alligators should be 1,200 words in length and submitted either on disk or via modem.

TELETOONS

BY FRANK AND TROISE



LETTERS

Calling card chaos

Your calling card Buyer's Guide was both entertaining and informative ("The calling card shuffle," NW, Aug. 13). However, readers should exercise caution and investigate these "deals" thoroughly.

Specifically, MCI Communications Corp.'s Around Town option is not quite what it appears. This option purports to reduce or eliminate the calling card surcharge when used within the subscriber's local calling area.

However, I discovered that the MCI system assumes that a city served by a different local exchange carrier is not within one's local calling area. Unfortunately, the Southern California area has been served by multiple local exchange carriers for many years (even within the same city).

I wasted a great deal of time with MCI in an attempt to resolve the situation. Its final solution was to offer multiple calling cards for each user — one for each local exchange carrier's territory. It finally admitted that it had no idea one of the country's largest telecommunications mar-

kets — soon to be served by six area codes within our single local access and transport area — was served by multiple local exchange carriers.

I now recommend that California users, and any others who have more than one local exchange carrier within their local calling area, avoid using MCI if they expect to benefit from the Around Town feature.

Martin Tabnik
Principal
META Consulting Group
Redondo Beach, Calif.

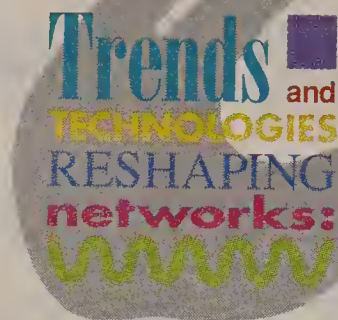
Network the BBS

I note that you folks now have a bulletin board system (BBS) available for use by your readers. That's nice, but it would be nicer still if your BBS were networked with others.
(continued on page 38)

Network World welcomes letters from its readers.

Letters should be typed, double-spaced and sent to Editor, Network World, 161 Worcester Road, Box 9172, Framingham, Mass. 01701.

Letters may be edited for space and clarity.



User Networking

Management becomes top user issue

Network management, once a secondary concern of users, is now a vital criterion without which vendors would not win networking contracts.

The preeminence of management is just one of several trends facing network managers this year. The other top trends are:

- A demand for standards or guarantees that standards will be made available in a timely fashion.
- An urgent need to manage local-area networks and to bring them under global control.
- The merging of centralized and distributed network management systems into a new "hybrid."
- A need to stave off the effects of scarce networking staff.
- A new willingness by users to switch vendors and demand compensation for any downtime for which the vendors are responsible.

Management to the fore

As network management becomes more important to users,

Salamone is Network World's features writer.

vendors have begun to get the message that bringing a product to market that is lacking in management capabilities is at least imprudent, if not risking serious marketing difficulties.

Consider the Fiber Distributed Data Interface standard. While its basic "networking" capabilities are set — data transport, interfaces and so on — and users can utilize them, FDDI is still not considered complete because it lacks standardized management specifications. By contrast, Ethernet and token ring became standards long before management was even considered.

How important is management? Essential. A recent request for proposal issued by the Tennessee Valley Authority (TVA) demonstrates this. The RFP demanded integrated management as a major part of the network contract. "Our goal is to consolidate the management and control of our network into a single facility," says Kelly Conway, a telephone systems manager for the TVA.

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Network World examines the top trends in user network strategies.

By SALVATORE SALAMONE





ILLUSTRATION ©1990 JULIA TALCOTT

(continued from page 34)

Along with the increased concern for management comes a growing interest in standards. As James Herman, a principal at Northeast Consulting Resources, Inc. in Boston, observes, Simple Network Management Protocol (SNMP) has become a highly popular tool in the last year because it fills a need for standards-based management protocols for interconnection devices.

Herman says he believes that network management inevitably will require a mix of proprietary and standardized approaches. Even if Open Systems Interconnection net management standards are approved, people will use a combination of standards-based and proprietary systems.

Faced with uncertain delivery dates of

standards-based network management systems, users planning networks today are caught in a no-win situation. They want their networks to have not only the latest proprietary improvements, but also to include or even be based on the latest implementations of standards.

But they also want their networks to stay standards-compliant as the standards are completed. To ensure that this will happen, network managers are putting evolutionary clauses in their RFPs.

Looking toward the future

"We put a current description of our network in an RFP, but we also put down how we see the network changing in the next three to five years," says John Lewis, principal telecommunications staff ana-

lyst with Public Service Electric and Gas Co. (PSE&G) of New Jersey. For example, "one of the things we would put in the RFP is that we'd like to be able to hook into ISDN down the road," Lewis says.

Lewis and others like him are telling vendors to put standards high on their list of priorities. In this regard, a mere promise to adopt standards at some point is not good enough; users are demanding that vendors participate in the standards process so that they can move quickly to standards when the time is ripe.

If vendors state that they have members on an [International Standards Organization] committee and they are keeping watch on the evolving standards, then that would definitely be a point in its favor," Lewis says.

Another trend is incorporating the management of LANs into the centralized management of wide-area networks. According to Northeast Consulting Resources' Herman, the current shift toward integration of LAN management into the more traditional, centralized corporate network operations marks significant progress in user net management strategies.

Herman adds that LAN users are demanding full-featured network management systems. Even purchasers of departmental LANs are more concerned about network management than they once were. "The greater proliferation of LANs has by all means increased importance of LAN management," Lewis says.

Michael Kennedy, a senior consultant at Arthur D. Little, Inc. in Cambridge, Mass., and head of the company's corporate networking unit, adds, "Network management of LANs has become more important as companies move from doing personal tasks — spreadsheets and word processing — to handling enterprisewide solutions."

In other words, the strategic applications that users run on LANs today are a major factor in elevating net management to a high priority. LANs are now being used to perform mission-critical tasks, rather than less important departmental chores.

If today's LAN goes down, the company is in hot water. Therefore, the corporate-level net manager had better know what's going on with the LAN. Net managers must be able to manage strategic LANs from wherever they are.

The downsizing of vital corporate applications is also having an impact on management. Kennedy cites the case of a company that moved its \$400 million-a-year accounts receivable system from a mini-computer onto a LAN with 65 personal computers. Once the LAN had no need for management; now it's essential. "Clearly," he says, "network management becomes a lot more important if you're handling \$400 million."

Centralized or not?

Network management has traditionally been divided into two philosophical camps: centralized and distributed. Today, the trend is for companies — even those with corporate structures that favor distributed systems — to adopt a hybrid approach, according to Paul Datoli, vice-president of Burlington, Mass.-based systems integrator NetVision, Inc.

With a hybrid approach, network management is distributed but information is passed to a central point of control. Development of the OSI network management standard has been careful not to preclude either the centralized or distributed approach, Herman says. And major vendors are following suit.

Both Digital Equipment Corp. and Hewlett-Packard Co. architectures are oriented toward distributed approaches that can be centralized. IBM gives users the ability to manage LANs in a decentralized way if they want to, he says.

IBM's approach is two-pronged. "They've developed a local management capability and a centralized capability," Herman says. "DEC and HP are more elegant in their approaches because they give you a single architecture that you can flexibly deploy as needed."

Distributed management systems offer more control of individual network elements, but many times, this higher level of control is accomplished using proprietary

(continued on page 38)

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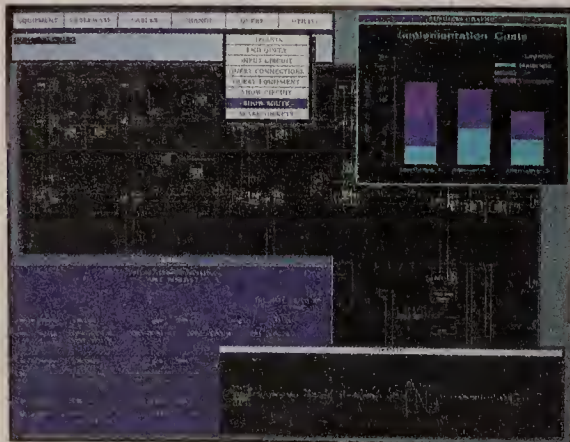
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AT&T

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this one.

(continued from page 36)

technology. Interfaces between the element management level and the integrated network management level exist, but they are not based on standards.

Does any network management protocol favor either centralized or distributed network management?

"I think SNMP has a tendency to favor decentralized management," Herman says. In a large enterprise, SNMP does not provide an easy means of centralizing management of a large collection of LANs. "It's really oriented toward poll monitoring at an area or campus level. And it isn't clear that SNMP gives you that fully centralized enterprise focal point that you see IBM, DEC, HP and AT&T trying to provide."

Today's distributed network management systems have the capability to report back to a central location on the state of network elements.

"It's analogous to a news wire service reporting what the weather is in Kansas every 30 seconds," says Mark Luczak, senior network specialist at Infotron Systems Corp. "We don't need that [level of detail]. What we need to know is when a tornado hits."

In other words, network managers need to be able to set thresholds for alerts — to be alerted about significant problems, not necessarily every minor glitch.

"In a distributed network management system, you can let the element management systems do things like alternate routing, traffic balancing, reporting of alarms and collection of statistics," Luczak says.

In a centralized network, the common desire of network managers is to have all information available on one screen and be able to run through its associated console all the proprietary tests for a particular element of the network.

To accomplish this type of centralized test and repair requires an interface between the element management system and the higher level integrated management system. "This is why

standards will be important," Luczak says. "What vendors need to do is make sure we have an interface to the next level beyond element management."

Theoretically, once OSI network management is adopted, anyone can do this type of integration. However, many network managers have said there's no way the OSI standard is going to cover this process, and if it did, products would not be compatible with it for years. "Everybody

“The law provides for liability, but it can be taken away in a contract.”



would have to redefine their equipment," Luczak says.

Lack of skilled workers

Some degree of centralized network management could alleviate the lack of skilled workers that managers are encountering when they try to find people to manage their networks. Managers are pushing vendors to deliver products that are easier to use and that have user-friendly graphical interfaces to assist less skilled workers. In addition, more network management is being outsourced.

In a *Network World* study of issues facing net managers (see "Survey: Chargebacks, cost controls drop '91 budgets," *NW*, Sept. 24), 42% of the respondents said they were outsourcing their network management because of staffing shortages or a lack of in-house expertise.

"Technologies such as better graphical user interfaces are making network management simpler," says Tom Viviano, product architect at Logica Data Architects, Inc. At the same time, he notes, network managers are

being called upon to manage more complex systems than they did in the past.

Today, a person sitting at a network management system console is more likely to be the equivalent of a security guard in a large company. "That person has to know who to call when something goes wrong," Luczak says.

Managers sweet on suits?

As networks take on more mission-critical applications, managers are demanding accountability when service disruptions occur. It seems that some net managers may be brushing up on liability laws — to seek compensation when networks fail.

"Liability is an important issue — not just a theoretical one — in the decisions that customers are making as they choose networks," says Ben Wright, a Dallas-based attorney specializing in communications technology legal issues. "It's having an impact on company policies."

For example, if Company A forces an electronic data interchange trading partner (Company B) to use a specific value-added network (VAN) provider and the VAN makes a mistake, in some courts, Company A is liable for business losses that result for Company B. In other courts, the

VAN is liable. These details must be specified in a contract if Company B wants to be sure it knows who to sue. Often, the issue of liability is covered in contracts or in the RFP.

Can people ever recover their losses when a network goes down? In theory, yes, but in practice, not very often, according to Wright. Network managers will find, for example, that most value-added networks insist on customers signing some type of an agreement in advance that limits liability.

In addition, most VANs — such as those that supply EDI services — are not required to file tariffs with the Federal Communications Commission. Thus their relationship with a customer is based on a contract. If they had to file a tariff, their relationship would be governed by that tariff.

"Both tariffs and contracts generally restrict the amount of liability tremendously," Wright says. "The law provides for liability, but it can be taken away or reduced in a contract."

Network managers are paying more attention to liability issues. One net manager who asked not to be identified says that when he was negotiating a contract with a VAN, he could not get the level of liability he wanted in the event of

a mistake by the VAN. Since he didn't feel comfortable with the VAN's offer, the manager says he decided to take his business elsewhere.

Instead of looking at liability, some are looking at who will fix problems in network management systems if they occur. "Part of our RFP asks what type of support a vendor is prepared to give if his hardware goes down or his software has some operating problems," says PSE&G's Lewis.

As Lewis points out, before managers will buy equipment, they want vendors to address possible network failures. The reason for this growing assertiveness is that network managers are under increasing pressure from corporate management to keep the company jewel — the network — running in a cost-effective way.

Faced with evolving standards, company politics, tighter budgets, fewer skilled workers and a proliferation of LANs, today's managers must try new ways to deal with old problems that get worse each year. In addition, they are demanding that vendors become more responsive, provide better service and support, and deliver products that meet emerging network standards. ■

Managing today's networks

Network management began as a fragmented collection of services or tools — sometimes labeled "diagnostics" — aimed at maintaining operational control over communications. Such diagnostic tools were usually purchased as an afterthought.

However, today's network administrator must manage an ever-expanding network, portions of which continuously undergo modernization and expansion while other parts are simply administered and maintained. And this job must be accomplished with limited and often decreasing funds.

One key to the simultaneous modernization, service maintenance and cost reduction is to recognize that network management has become a scientific discipline that can be divided into a set of activities. These activities are:

■ **Network planning.** Determine requirements, plan architectures and configure equipment, facilities and carrier services to minimize costs.

■ **Procurement management.** Develop equipment requirements, generate requests for proposal from vendors and evaluate responses.

■ **Program management.** Specify performance requirements, order transmission circuits and equipment, test installations against performance criteria, supervise vendors and

test against overall acceptance criteria.

■ **Network operations.** Recruit, train and staff network control centers, install appropriate alarm and diagnostic tests to isolate faulty equipment and transmission circuits, maintain work order and record keeping systems to document changes, provide user support to assist in using the net and adapting to network failures, and document operational performance in periodic reports to management.

■ **Analysis and reporting.** Analyze facility and equipment performance, monitor the status of network elements, generate reports to users, operators, managers and suppliers.

■ **Maintenance.** Maintain terminal, facility and switch equipment.

■ **Configuration, pricing and tariff data bases.** Maintain records of circuits and equipment, as well as alarms and diagnostics associated with these elements. Maintain tariff data bases to verify bills, to select least cost circuits when extending the network and to optimize the net with day-to-day changes.

■ **Network administration.** Issue and track work orders for network modification and repair. Charge costs back to originating end users. Track network performance in terms of user needs and adjust accordingly,

generating reports to users, operators and managers.

Improving network management is a continuing process, which has advanced from ensuring that necessary functions are carried out to ensuring that these functions are performed efficiently and at the least possible cost. To improve the management process, network managers should:

■ Identify who is involved, when and where, starting with net facilities and inventory; make sure the sources of network data are accurate and timely and record-keeping systems are designed for ease of use, efficiency and responsiveness.

■ Automate manual processes only after they have been optimized to reduce demands on scarce manpower.

■ Use expert systems to augment diagnostic, monitoring and control systems.

■ Establish optimization systems that analyze the network, predict and adjust for traffic loads and enable you to design optimal configurations based on carrier tariffs.

■ Consolidate existing networks and nodes where it is economically feasible and where it makes operational sense.

— Howard Frank
Chairman and
chief executive officer
Network Management, Inc.
Fairfax, Va.

Letters

continued from page 33

er BBSs around the country so that readers could send messages to you as easily as making a local call.

Many BBSs are now linked into UseNet, FidoNet or similar communications networks that allow readers to send messages on a local BBS and would let those messages be forwarded automatically to your BBS in the middle of the night.

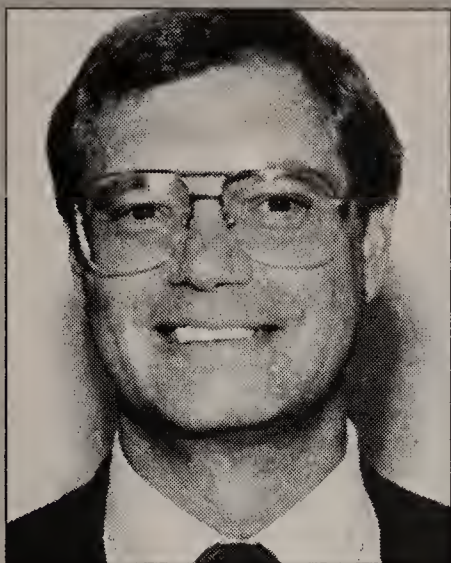
Such connectivity also allows you to participate in conferences. On FidoNet, for example, there is an "echomail" conference called Main Distribution Frame (MDF), which is a telephone industry

conference carried by several BBSs around the country and in Canada.

FidoNet is primarily an amateur communications network, but you can find a local FidoNet BBS in almost all major cities and even in some of the most unlikely places, including many rural areas.

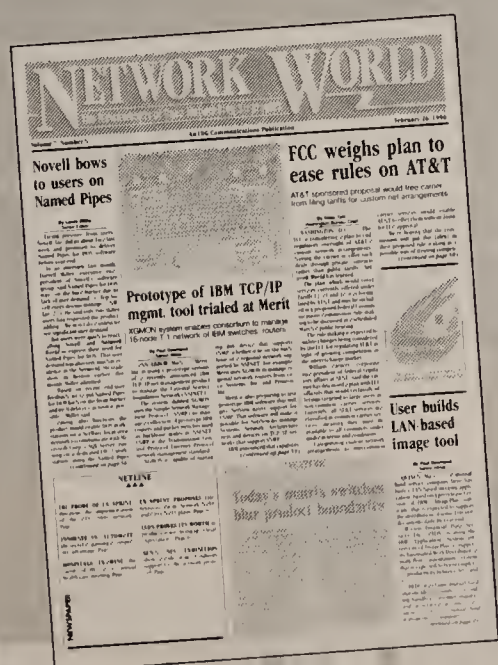
UseNet is a more professional network, but the BBS software available for linking a personal computer into UseNet leaves something to be desired. And casual access to UseNet conferences from local BBSs is not as ubiquitous as access to FidoNet conferences.

Jack Decker
Sault Sainte Marie, Mich.



John Brockett
Assistant Vice President/
Telecommunications
CSX Technology

"Without Network World's broad coverage of what's happening in the industry, we'd be operating in the blind."



For John Brockett, Assistant Vice President of Telecommunications at CSX Technology in Jacksonville, FL, networking means annualized savings of over \$12 million. While he and his telecommunications staff provide voice, data, image, and video services to all corporate offices and major business units, about 85% of their efforts are dedicated to CSX Transportation, the corporation's 22,000-mile railroad system.

"Our large private network has given us the most leverage in reducing costs. This 4000-mile fiber-optic backbone links 350 voice and 200 data locations, plus 10 videoconferencing rooms. Alone, it accounts for a good two-thirds of the \$12 million we're saving annually, primarily in long-distance service and private data lines.

"The railroad, in particular, is always looking for ways to reduce its operating budget. Telecommunications technology has been effectively utilized to enable consolidation of distributed field operations such as dispatching and crew calling into one centralized train control center, resulting in lower operating costs and a more efficient operation. A strong network provides two-way communication between dispatchers at the center and engineers, conductors and brakemen in the field. Now, fewer dispatchers control train movement over 300 to 400 miles of track.

"Networking also plays a key role at the CSX customer service center. Supported by an 800-number service

and a large PBX with a call distribution system, representatives deliver up-to-the-minute status reports to as many as 20,000 customers every day.

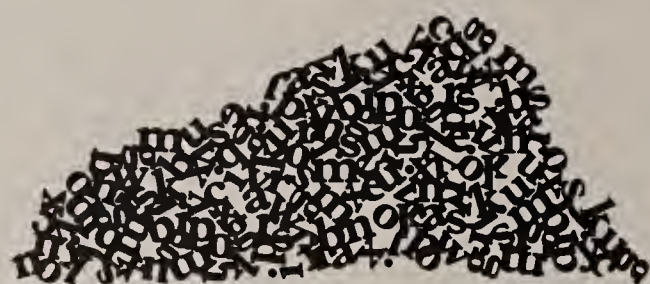
"Now we're looking at other programs in hopes of saving another \$3 to \$4 million annually. But we can't do it alone. We need *Network World's* timely coverage of new technologies and products. When we read about specific product features, it triggers us to talk with suppliers and find out what's applicable to our network. *Network World* is also an excellent source for gaining insight into the network applications, supplier contracts and competitive pricing strategies of other organizations. And it's where we turn for updates on FCC and state government regulatory actions.

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10BASET

NETWORKING

PRODUCTS

10BaseT standard brings products, problems

CONTINUED FROM PAGE 1

The outpouring of new 10-BaseT products might seem like good news for users, but those who have already gained experience with this latest Ethernet permutation view it as a mixed blessing.

Most users report that different vendors' 10BaseT components interoperate at the electrical level. That is, transmission over unshielded twisted pair using modular RJ-45 telephone jacks and wiring closet-based repeater hubs can effectively replace the RG-58 coaxial cable and BNC connectors used in local-area networks based on 10Base2,

Mier is president of Mier Communications, Inc., a Princeton, N.J.-based network consultancy that specializes in customized protocol analysis and planning.

which is called Cheapernet. Some years back, Cheapernet replaced the rigid, pipe-like coaxial cable prescribed in the original IEEE Ethernet specification known as 10Base5.

While twisted pair is unquestionably less expensive and easier to install and manage than either of the previous Ethernet coaxial cable types, the topological differences of a 10BaseT network introduce some new twists to LAN management, especially in fault isolation, bandwidth

CHART • GUIDE

A chart comparing features of different 10BaseT adapters begins on page 46, and a chart comparing features of 10BaseT hubs/concentrators starts on page 58.

management and central-site monitoring.

In fact, effective central-site management of a complex 10-BaseT network in which different vendors' adapters and hubs are mixed is impossible today.

"Each of these vendors uses a different network management approach and different network management protocols," laments the manager of a massive interconnected Ethernet LAN at a prominent Northeast defense contractor who asked to remain anonymous. "When we mix or match hardware, we're finding that it's not as plug-and-play as the vendors say."

Management differences

The management issues relate to the fundamental differences in LAN topology and cabling that 10BaseT entails (see "Ethernet over twisted pair," page 54).

One problem is the propensity for miswiring in a 10BaseT network.

Because of the way the four

Products tailored for evolving standard could pose dilemmas.

conductors are assigned to the RJ-45 connector, it's easy to mistakenly reverse the polarity of wire pairs. No such possibility exists. (continued on page 42)

(continued from page 41)

ists with single-cable Ethernets.

The center-pair position of the RJ-45 jack, which is the first pair used in telephone wiring, is never used for the 10BaseT leads. In fact, the specification intentionally left the center-pair position vacant so it could be used for an analog phone line.

Unfortunately, a single pair may not be sufficient for tomorrow's needs.

Integrated Services Digital Network Primary Rate Interface, as well as 10BaseT, require four wires to the desktop, so wiring problems are likely to become even more of an issue in the years ahead as both 10BaseT and ISDN find their way to the user's desktop.

10BaseT adapters (see chart, page 46) vary considerably in their capabilities and features regarding miswired 10BaseT links. Many have LEDs that indicate link status after the connection is wired and plugged in. However, some will light when the link is correctly wired and working, while others light only when something is wrong and yet others will light green to indicate a good link or red for a bad link.

A growing trend is to add a small amount of intelligent circuitry to the adapter or the hub to give the adapter or port interface at the hub the ability to correct the situation when it detects a polarity reversal.

Collision course

Some users have been under the misconception that transmission collisions are significantly reduced or eliminated altogether in the 10BaseT topology. This is untrue.

Collisions — in which two or more devices begin transmitting at nearly the same instant, thus corrupting both transmissions and requiring that both back off and wait — are as much a part of Ethernet life with 10BaseT as with a coaxial bus topology.

Even though a 10BaseT network consists of many point-to-point links interconnected at a hub concentrator in a star topology rather than a single coaxial cable bus shared by all users, collisions will occur just as frequently on a 10BaseT network as on a 10Base2 cable, assuming all other factors remain the same.

However, the typically wall- or rack-mounted 10BaseT hub becomes a focal point of sorts for Ethernet collisions. Per the 10BaseT specification, the hub must perform full regeneration of all transmissions received from any attached point-to-point 10BaseT segment to all of the others. Therefore, the hub can keep a close watch on collisions.

Most 10BaseT hubs offer features designed to detect, count or otherwise monitor collisions (see chart beginning on page 58). But just as with 10BaseT adapters, there is no consistency to the way the hubs display or re-

act to collision conditions.

10BaseT hubs are obligated under the 802.3 repeater specification to monitor consecutive collisions that occur on an individual link. The hub must record which links and stations caused each collision as well as count the number of collisions.

Consecutive collisions mean that every time a station on a particular link attempts to send, its

packet bumps into a packet that another station is sending. And if this occurs for a protracted period, it can eventually cause data transfer on all of the attached links to grind to a halt.

Hubs are, therefore, required to cut off or partition any link at which too many consecutive collisions occur so that the rest of the network can continue to function.

The specification does not establish a specific number of consecutive collisions, except that the number has to be more than 30. Some hubs, therefore, will cut off a segment at 31 consecutive collisions, while others will trigger at a much higher value, for example, at 90 consecutive collisions or more.

There is likely something wrong when a particular station

or link encounters too many collisions. It could be that the transmitting station's "random back-off and retransmit" mechanism isn't working correctly or that the packet size used by the colliding station is too large. Or it could be that the hub is detecting activity on the link even when there is none. Whatever the case, segmentation is the most appropriate and required solution.

Technology for



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Some hubs will send an urgent alarm message to a management console when a link is partitioned. Others will illuminate an LED, which could go unnoticed in a wiring closet for days, though it's likely that the partitioned user will start screaming as soon as he goes off-line.

Some hubs are able to reinsert a segmented link based on a message from the management con-

sole or automatically after a pre-specified delay without interfering with the operation of the network. For other hubs, however, reinsertion can be quite disruptive and may even require that the hub and all attached links be powered down and then reactivated.

A common complaint shared by most 10BaseT users is the lack of standardized management for

a network consisting of a mix of vendors' adapters, hubs and other 10BaseT components.

SNMP support

Several of those shown in the accompanying chart incorporate a Simple Network Management Protocol (SNMP) agent, which is a major first step toward effective centralized network management of different vendors' hubs

and adapters. Several others say they are developing an SNMP-based status- and alarm-reporting capability due out later this year or in early 1991.

Yet while SNMP-based reporting and management is clearly a trend that more 10BaseT equipment manufacturers are moving toward, only a relatively small percentage are delivering it today.

What's more, many of the 10BaseT hub units — especially the lower priced, self-contained, fixed-configuration ones — lack the inherent processing prowess to retrofit any intelligent network management capabilities, whether SNMP-based or proprietary.

Global LANs

A manager for one large user organization who requested anonymity said his company has deployed 10BaseT extensively and that hub-based twisted-pair networking has made it much easier to link "islands" of cable-based Ethernet LANs into a single enterprise-wide LAN.

In fact, the manager said he is concerned that 10BaseT may be making it too easy to establish connections. Because of the dearth of effective 10BaseT network management, administrators have little control over the resultant sprawling network.

When Ethernet segments are interconnected via hubs, the result is a single logical network entity. And in the absence of safeguards or controls, anyone at any workstation on the network has access — at least at the physical and data-link level — to any resource anywhere on the network.

This poses security and bandwidth management problems because there's still just 10M bit/sec of bandwidth to be shared by a much larger number of users. Where the physical network of a single-cable Ethernet island may meander through a department, it can still be easily traced. And the local manager can keep a tight rein on who has access to the department's server or disk files.

Unfortunately, such tight control may not be possible with hub repeaters. Indeed, with a proliferation of hubs in wiring closets, it is easy to connect one major Ethernet subnetwork with another. Two nearby hubs, attached to different subnetworks, can easily be linked with a standard telephone extension cord.

10BaseT hubs lack the ability and intelligence inherent in bridges to filter and selectively forward packets based on user-definable parameters, though some hub vendors offer bridge modules as plug-in options. Indeed, a hub's function is to make sure that every link has free and clear access to every other link.

Some solutions to such security and traffic management problems are emerging. For example, Kalpana, Inc., a small firm in Los Gatos, Calif., offers its Ether-Switch (see chart, page 78). The unit, which allows attachment of as many as seven 10BaseT LAN segments, intelligently switches packets from any segment to any other with a per-packet delay of 40 microsec.

The company claims that by logically discriminating between which traffic goes where, traffic

(continued on page 60)

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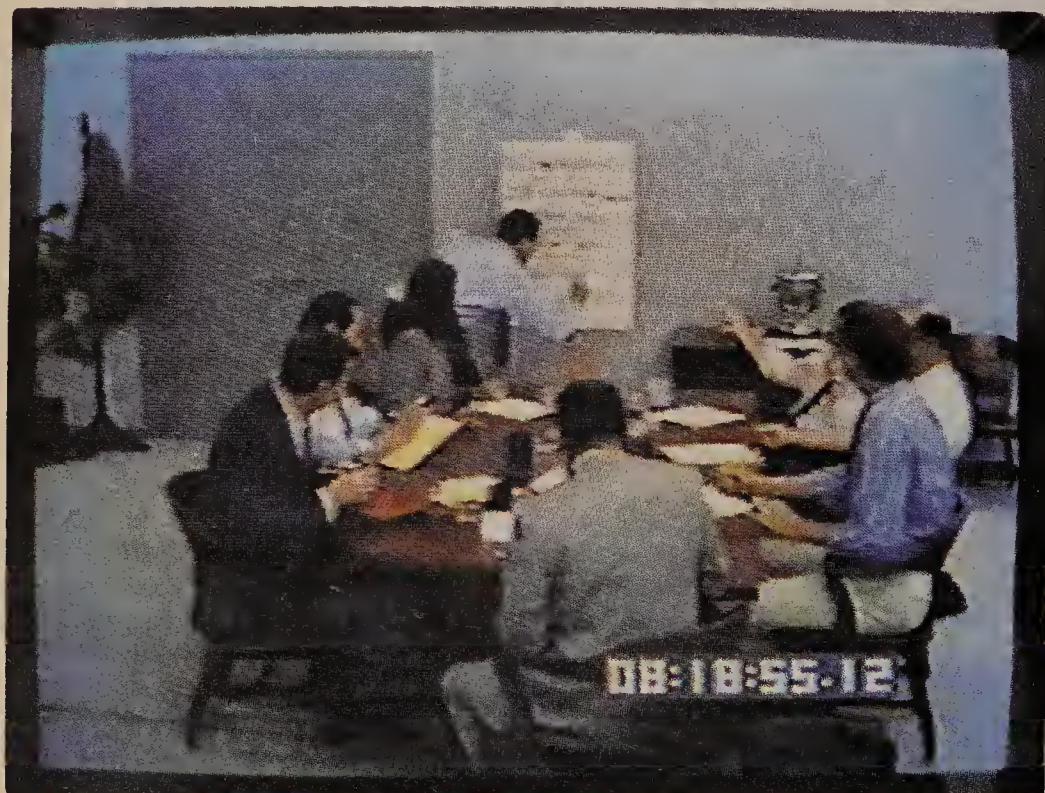
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10BaseT adapters (continued on page 50)

Vendor	Model	System supported	Bus	Connectors	Software, protocols, interfaces supported	Hub compatibility	Distance to hub	Wiring	LED indicators	Price	Other features/comments
Accton Technology Corp. Fremont, Calif. (415) 226-9800	EtherPair-8T	PC, XT, AT	PC, AT	RJ-45, AUI	NetWare 286/386, 3+Share, 3+Open, LAN Manager, TCP/IP, NETBIOS, DECnet/DOS	(1); others that are unspecified compatible 10BaseT-compliant	100 meters	AT&T's PDS	None specified	\$379	Novell NE1000 compatible
	EtherPair-8WT	PC, XT, AT	PC, AT	RJ-45 and AUI	NetWare 286/386, 3+Share, 3+Open, LAN Manager, TCP/IP, NETBIOS, DECnet/DOS	(1); others that are unspecified compatible 10BaseT-compliant	100 meters	AT&T's PDS	None specified	\$379	Western Digital Corp. WD8003E compatible
	EtherPair-8WBT	PC, XT, AT	PC, AT	RJ-45 and AUI	NetWare 286/386, 3+Share, 3+Open, LAN Manager, TCP/IP, NETBIOS, DECnet/DOS	(1); others that are unspecified compatible 10BaseT-compliant	100 meters	AT&T's PDS	None specified	\$399	Western Digital compatible with boot ROM
	EtherPair-16T	PC, XT, AT	PC, AT	RJ-45 and AUI	NetWare 286/386, 3+Share, 3+Open, LAN Manager, TCP/IP, NETBIOS, DECnet/DOS	(1); others that are unspecified compatible 10BaseT-compliant	100 meters	AT&T's PDS	None specified	\$419	Novell, Inc. NE2000 compatible
	EtherPair-NE2T	PS/2	MCA	RJ-45 and AUI	NetWare 286/386, 3+Share, 3+Open, LAN Manager, TCP/IP, NETBIOS, DECnet/DOS	(1); others that are unspecified compatible 10BaseT-compliant	100 meters	AT&T's PDS	None specified	\$479	Novell NE2 Micro Channel compatible
	Pocket LAN-10T	Laptops	External	RJ-45 and AUI	NetWare 286/386, 3+Share, 3+Open, LAN Manager, TCP/IP, NETBIOS, DECnet/DOS	(1); others that are unspecified compatible 10BaseT-compliant	100 meters	AT&T's PDS	None specified	\$499	
	AUI Transceiver	Any with AUI		AUI to RJ-45	Software transparent	(1); others that are unspecified compatible 10BaseT-compliant	100 meters	AT&T's PDS	None specified	\$119	No external power required
BICC Data Networks, Inc. Westborough, Mass. (508) 898-2422	ISOLAN 4110-4	PC, AT	PC, AT (16 bit)	RJ-45 and AUI	NetWare 286/386, MS-Net, DOS, LAN Manager, TCP/IP, NETBIOS, Unix, NFS	(1); Cabletron Systems, Inc., Hewlett-Packard Co., 3Com Corp., others	100 meters	Unspecified	None specified	\$375	Bus-mastering adapter
	ISOLAN 1181 UTP	Any with AUI		AUI to RJ-45	Software transparent	(1); Cabletron Systems, HP, 3Com, others	100 meters	Unspecified	None specified	\$195	
Cabletron Systems, Inc. Sunnyvale, Calif. (603) 332-9400	E1010 DNI	PC, XT	PC (8 bit)	RJ-45 and AUI	None specified	(1); others that are 10BaseT-compliant	125 meters (typical)	22 to 26 AWG; 75 to 165 ohm	Polarity detection and correction	\$395; \$449	8K-byte on-board RAM; 32K-byte on-board RAM
	E2010 DNI	PC, AT	PC, AT (16 bit)	RJ-45 and AUI	None specified	(1); others that are 10BaseT-compliant	125 meters (typical)	22 to 26 AWG; 75 to 165 ohm	Polarity detection and correction	\$495; \$549	16K-byte on-board RAM; 64K-byte on-board RAM
	E3010 DNI	PS/2	MCA	RJ-45 and AUI	None specified	(1); others that are 10BaseT-compliant	125 meters (typical)	22 to 26 AWG; 75 to 165 ohm	Polarity detection and correction	\$649; \$699	16K-byte on-board RAM; 64K-byte on-board RAM
	E4010 DNI	Apple Computer, Inc. Macintosh SE	Internal SE bus	RJ-45 and AUI	None specified	(1); others that are 10BaseT-compliant	125 meters (typical)	22 to 26 AWG; 75 to 165 ohm	Polarity detection and correction	\$699; \$749	16K-byte on-board RAM; 64K-byte on-board RAM
	E5010 DNI	Macintosh SE/30	Internal SE/30 bus	RJ-45 and AUI	None specified	(1); others that are 10BaseT-compliant	125 meters (typical)	22 to 26 AWG; 75 to 165 ohm	Polarity detection and correction	\$699; \$749	16K-byte on-board RAM; 64K-byte on-board RAM
	E6010 DNI	Macintosh II	Nubus	RJ-45 and AUI	None specified	(1); others that are 10BaseT-compliant	125 meters (typical)	22 to 26 AWG; 75 to 165 ohm	Polarity detection and correction	\$699; \$749	16K-byte on-board RAM; 64K-byte on-board RAM
David Systems, Inc. Sunnyvale, Calif. (408) 720-8000	Ether-T PC	PC, XT, AT	PC (8 bit)	RJ-45 and AUI	NetWare 286/386, VINES (NDIS), LAN Manager (NDIS), TCP/IP, SNMP	(1); others that are 10BaseT-compliant	100 meters	24 AWG	None specified	\$350	40K-byte RAM buffer; NetWare boot PROM optional
	Ether-T PC/AT Adapter	PC, AT	PC, AT (8 or 16 bit)	RJ-45	NetWare 286/386, VINES (NDIS), LAN Manager (NDIS), TCP/IP, SNMP	(1); others that are 10BaseT-compliant	100 meters	24 AWG	None specified	\$350	64K-byte RAM buffer
	Ether-T AT	PC, AT	PC, AT (16 bit)	RJ-45 and AUI	NetWare 286/386, VINES (NDIS), LAN Manager (NDIS), TCP/IP, SNMP	(1); others that are 10BaseT-compliant	100 meters	24 AWG	None specified	\$445	64K-byte RAM buffer; NetWare boot PROM optional
	Ether-T MC	PS/2	MCA	RJ-45 and AUI	NetWare 286/386, VINES (NDIS), LAN Manager (NDIS), TCP/IP, SNMP	(1); others that are 10BaseT-compliant	100 meters	24 AWG	None specified	\$460	64K-byte RAM buffer; NetWare boot PROM optional
	TP-MAU	Any with AUI		AUI to RJ-45	Software transparent	(1); others that are 10BaseT-compliant	100 meters	24 AWG	Link integrity, others	\$149	
	BNC-MAU	Any with BNC		BNC to RJ-45	Software transparent	(1); others that are 10BaseT-compliant	100 meters	24 AWG	Link integrity, others	\$149	
Digital Communications Associates, Inc. Alpharetta, Ga. (404) 442-4000	10BaseTP Industry Standard Architecture	PC, XT, AT	PC, AT (8 or 16 bit)	RJ-45	NetWare 286, 2.15 and LAN Manager NDIS drivers	(1), Cabletron, SynOptics Communications, Inc.	Maximum of 100 meters	22 to 26 AWG	Network activity, link status	\$425	32K-byte dual-port RAM
	10BaseTP MCA	PS/2	MCA (16 bit)	RJ-45	NetWare 286, 2.15 and LAN Manager NDIS drivers	(1); Cabletron, SynOptics	Maximum of 100 meters	22 to 26 AWG	Network activity, link status	\$475	64K-byte dual-port RAM
	10BaseTP Transceiver	Any with AUI		AUI to RJ-45	Software transparent	(1); Cabletron, SynOptics	Maximum of 100 meters	22 to 26 AWG	Power, collision, jabber, link status	\$195	Selectable Signal Quality Error operation
Digital Equipment Corp. Maynard, Mass. (508) 493-5111	EtherWorks Turbo/TP	PC, AT	PC, AT (16 bit)	RJ-45	NetWare 2.15 (client), DOS, OS/2, NDIS, DECnet for DOS and OS/2 (LanWorks)	DECRepeater 350 only (1)	100 meters	DECconnect (4-pair cable)	None specified	\$395	
	H3350 MAU	Any with AUI		AUI to RJ-45	Software transparent	DECRepeater 350 only	100 meters	DECconnect	Link integrity, error detection	\$150	

AUI = attachment unit interface
 AWG = American wire gauge
 LAT = DEC's Local Area Transport
 MCA = Micro Channel Architecture
 NDIS = Network Driver Interface Specification

NFS = Network File System
 PDS = Premises Distribution System
 PROM = Programmable read-only memory
 SNMP = Simple Network Management Protocol

FOOTNOTE:

(1) See 10BaseT hubs/concentrators chart starting on page 58.

This chart includes a representative selection of vendors in the 10BaseT adapter market. Vendors may offer other 10BaseT adapters, and other vendors not included may offer a full range of competitive products.

SOURCE: MIER COMMUNICATIONS, INC. PRINCETON JUNCTION, N.J.



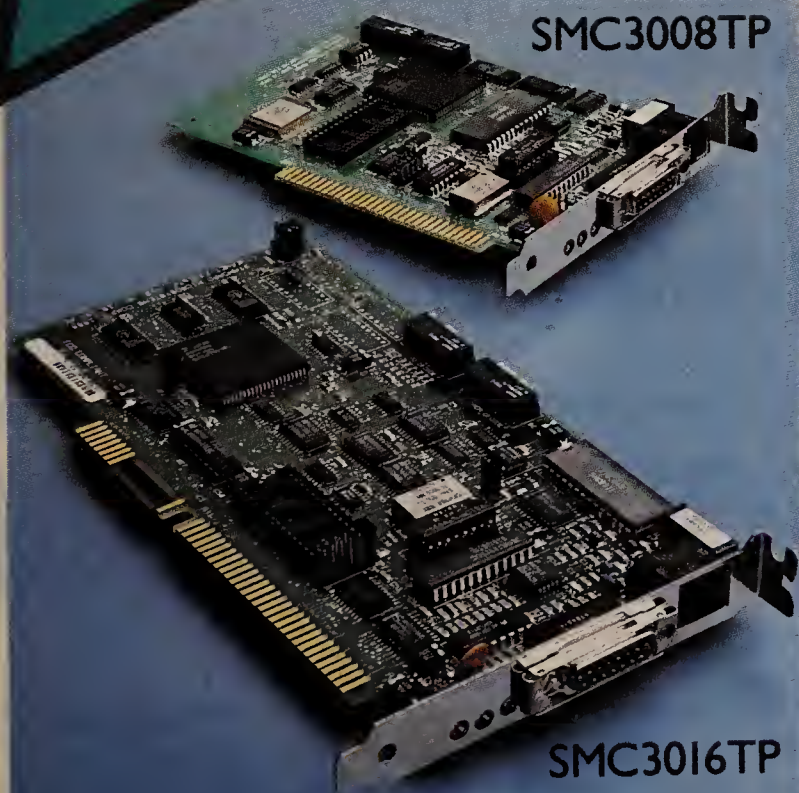
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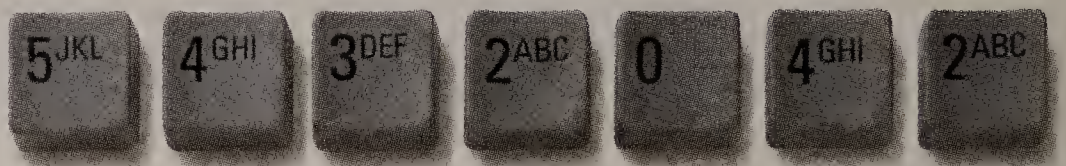
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number now...



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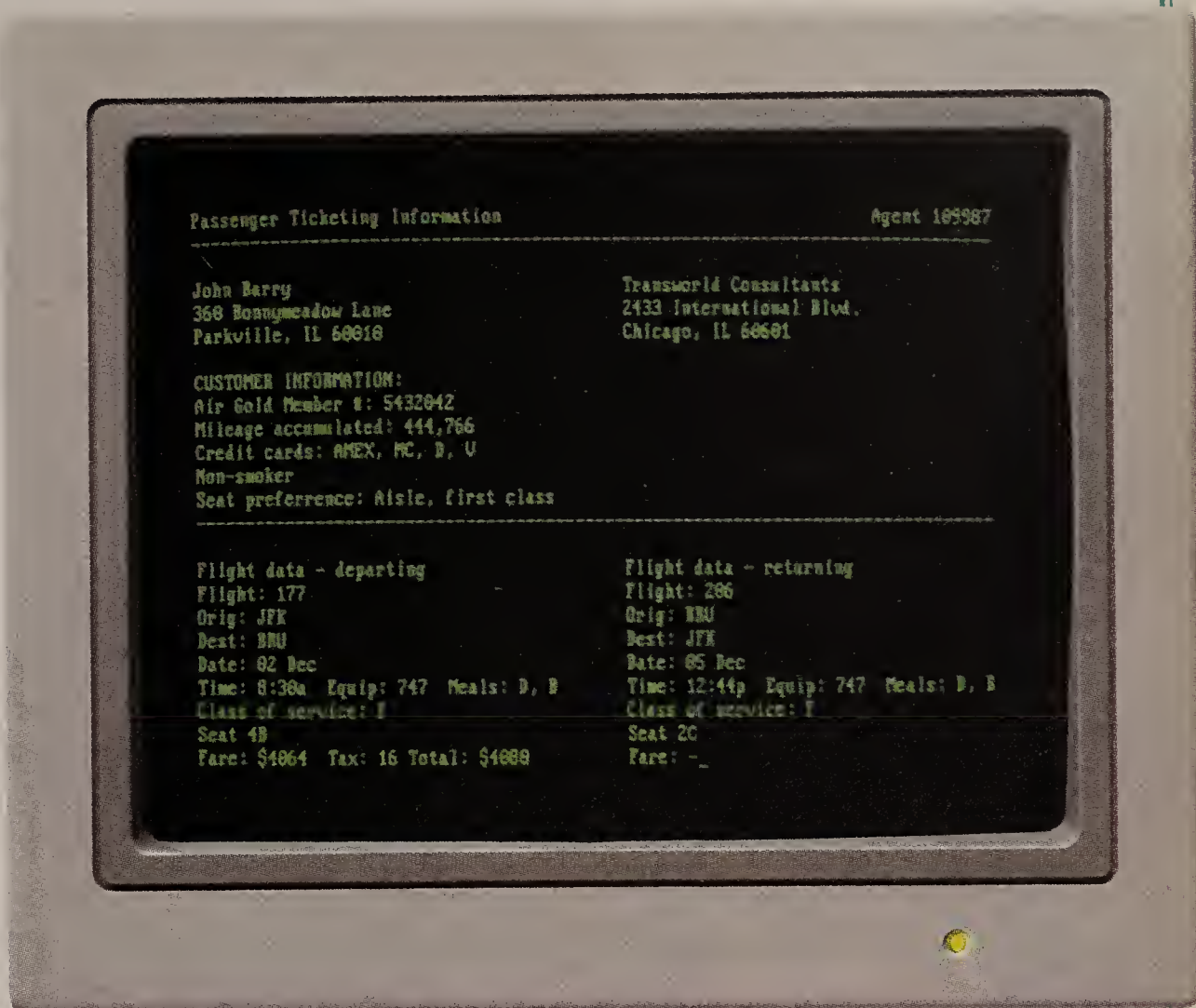
is 444,766 miles. We

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ring you to an agent... "Hello, Mr. Barry, how are you?

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10BaseT adapters (continued on page 52)

Vendor	Model	System supported	Bus	Connectors	Software, protocols, interfaces supported	Hub compatibility	Distance to hub	Wiring	LED indicators	Price	Other features/comments
E.I. du Pont de Nemours & Co. Research Triangle Park, N.C. (919) 481-5100	ETT Transceiver	Any with AUI		AUI to RJ-45	Software transparent	(1)	100 meters	Unspecified twisted pair	Polarity, power, link status, others	\$199	Maximum of 150 meters via IBM Type 1 or 2 cable; separate du Pont power supply required
Farallon Computing, Inc. Emeryville, Calif. (415) 596-9100	PhoneNET for Ethernet	Macintosh II	NuBus	RJ-45 and AUI	Macintosh O/S and EtherTalk	(1); others that are 10BaseT-compliant	Maximum of 100 meters	24 AWG	Link integrity	\$595	Includes Timbuktu file-transfer and screen-sharing software
	PhoneNET for Ethernet	Macintosh SE/30	Internal SE/30 bus	RJ-45 and AUI	Macintosh O/S and EtherTalk	(1); others that are 10BaseT-compliant	Maximum of 100 meters	24 AWG	Link integrity	\$595	Includes Timbuktu file-transfer and screen-sharing software
	StarConnector Series 500 EN	Any with AUI		AUI to RJ-45	Software transparent	(1); others that are 10BaseT-compliant	Maximum of 100 meters	24 AWG	Collision, receive, transmit, others	\$195	
Fibermux Corp. Chatsworth, Calif. (818) 709-6000	CC6641Z	PC, XT, AT	PC, AT (8 bit)	RJ-45 and DB-9	Any with DOS 3.0 or later	(1); others that are 10BaseT-compliant	Maximum of 100 meters	Unspecified twisted pair	None specified	\$395	DB-9 connector for IBM Cabling System
	CC6642Z	PC, AT	PC, AT (16 bit)	RJ-45 and DB-9	Any with DOS 3.0 or later	(1); others that are 10BaseT-compliant	Maximum of 100 meters	Unspecified twisted pair	None specified	\$495	DB-9 connector for IBM Cabling System
Gandalf Data, Inc. Wheeling, Ill. (708) 541-6060	LANLine/AT	PC, XT, AT	PC, AT (8 or 16 bit)	RJ-45	NetWare 2.15 or later	(1); others that are 10BaseT-compliant	Maximum of 100 meters	22 to 26 AWG	None	\$400	Optional remote boot erasable programmable read-only memory
	Mini MAU Transceiver	Any with AUI		RJ-45	Software transparent	(1); others that are 10BaseT-compliant	Maximum of 100 meters	22 to 26 AWG	Transmit, jabber, collision, continuity	\$175	Powered from AUI interface
Gateway Communications, Inc. Irvine, Calif. (714) 553-1555	G/EtherTwist PC	PC, XT, AT	PC, AT (8 bit)	RJ-45 and AUI	NetWare 2.0, 2.1X, 3+Share, TCP/IP	(1); David Systems, Inc., SynOptics, Western Digital, others	Maximum of 100 meters	22 to 26 AWG twisted pair	None specified	\$345	Adapter occupies half-sized slot; 40K-byte on-board RAM
	G/EtherTwist AT	PC, AT	PC, AT (16 bit)	RJ-45 and AUI	NetWare 2.0 and later, 3+Share, TCP/IP, OS/2 LAN Manager	(1); David Systems, SynOptics, Western Digital, others	Maximum of 100 meters	22 to 26 AWG twisted pair	None specified	\$425	64K-byte on-board RAM
	G/EtherTwist MC	PS/2	MCA (16 bit)	RJ-45 and AUI	NetWare 2.0 and later, NDIS, TCP/IP	(1); David Systems, SynOptics, Western Digital, others	Maximum of 100 meters	22 to 26 AWG twisted pair	Link, transmit, receive, jabber	\$460	64K-byte on-board RAM
Hewlett-Packard Co. Roseville, Calif. (916) 785-5000	EtherTwist PC	PC, AT	PC, AT (8 or 16 bit)	RJ-45	NetWare and NDIS drivers	(1); others that are 10BaseT-compliant	100 meters (typical)	22 to 26 AWG	None specified	\$445	Native 8- or 16-pin connectors on PC cards
	EtherTwist Micro Channel	PS/2	MCA (16 bit)	RJ-45	NetWare and NDIS drivers	(1); others that are 10BaseT-compliant	100 meters (typical)	22 to 26 AWG	None specified	\$495	
	EtherTwist MAU	Any with AUI		AUI to RJ-45	Software transparent	(1); others that are 10BaseT-compliant	100 meters (typical)	22 to 26 AWG	None specified	\$159	
Hughes LAN Systems Mountain View, Calif. (415) 966-7300	4141W Adapter	PC, XT, AT	PC, AT (8 bit)	RJ-45 and AUI	NetWare, 3+, LAN Manager (DOS and OS/2), VINES, NETBIOS, DECnet, TCP/IP, NFS, LAT	Cabletron, SynOptics, Chipcom Corp., others that are 10BaseT-compliant	Maximum of 100 meters	PDS, IBM Type 3	None specified	\$495	\$795, software for TCP/IP, LAT and NFS (ProLINC) is included with adapter
	4141W/A Adapter	PS/2	MCA (16 bit)	RJ-45 and AUI	NetWare, 3+, LAN Manager (DOS and OS/2), VINES, NETBIOS, DECnet, TCP/IP, NFS, LAT	Cabletron, SynOptics, Chipcom, others that are 10BaseT-compliant	Maximum of 100 meters	PDS, IBM Type 3	None specified	\$495	\$795, software for TCP/IP, LAT and NFS (ProLINC) is included with adapter
IMC Networks Corp. Tustin, Calif. (714) 259-1020	PCnic 8-bit TP	PC, XT, AT	PC, AT (8 bit)	RJ-45	NetWare 286, TCP/IP, NFS	(1); others that are 10BaseT-compliant	Maximum of 100 meters (typically)	24 AWG	Link integrity	\$275	8K-byte RAM; for workstations only
	PCnic TP	PC, AT	PC, AT (16 bit)	RJ-45	NetWare 286 or 386, TCP/IP, NFS	(1); others that are 10BaseT-compliant	Maximum of 100 meters (typically)	24 AWG	Link integrity	\$325	16K-byte RAM; 64K-byte RAM version (for file servers) costs \$350
	PCnic II TP	PS/2	MCA (16 bit)	RJ-45	NetWare 286 or 386, TCP/IP, NFS	(1); others that are 10BaseT-compliant	Maximum of 100 meters (typically)	24 AWG	Link integrity	\$350	16K-byte RAM; 64K-byte RAM version (for file servers) costs \$375
Kodiak Technology San Jose, Calif. (408) 441-6900	Raven N8 UTP	PC, XT, AT	PC, AT (8 bit)	RJ-45	NetWare	Cabletron, others that are 10BaseT-compliant	100 meters	Unspecified	None specified	\$449	64K-byte RAM; add \$50 for version with boot PROM
	Raven 16N UTP	PC, AT	PC, AT (16 bit)	RJ-45	NetWare	Cabletron, others that are 10BaseT-compliant	100 meters	Unspecified	None specified	\$549	64K-byte RAM; add \$50 for version with boot PROM
LanNet Data Communications, Inc. Huntington Beach, Calif. (714) 891-1964	LEC-45T	PC, XT, AT	PC (8 bit)	RJ-45	NetWare 286/386, 3+/3+ Open, LAN Manager, NETBIOS, DECnet/DOS	(1); Cabletron, AT&T, others	123 meters or more	PDS 24 AWG	None specified	\$395	Third-party drivers available for NFS, TCP/IP, Xenix, VINES, NDIS
	LE-45T Transceiver	Any with AUI		AUI to RJ-45	Software transparent	(1); Cabletron, AT&T, others	123 meters or more	PDS 24 AWG	None specified	\$169	Both units feature automatic polarity detection and correction
NetWorth, Inc. Irving, Texas (214) 869-1331	PC LAN Card	PC, XT, AT	PC (8 bit)	RJ-45 and AUI	None specified	(1); Cabletron, SynOptics, others	100 meters	Unspecified	None specified	\$349	Occupies half-sized slot
	PC LAN Card	PC, AT	PC, AT (16 bit)	RJ-45 and AUI	None specified	(1); Cabletron, SynOptics, others	100 meters	Unspecified	None specified	\$399	Occupies half-sized slot
	EtherNext Micro Channel NIC	PS/2	MCA	RJ-45 and AUI	None specified	(1); Cabletron, SynOptics, others	100 meters	Unspecified	None specified	\$449	

AUI = attachment unit interface
 AWG = American wire gauge
 LAT = DEC's Local Area Transport
 MCA = Micro Channel Architecture
 NDIS = Network Driver Interface Specification

NFS = Network File System
 PDS = Premises Distribution System
 PROM = Programmable read-only memory
 SNMP = Simple Network Management Protocol

FOOTNOTE:

(1) See 10BaseT hubs/concentrators chart starting on page 58.

This chart includes a representative selection of vendors in the 10BaseT adapter market. Vendors may offer other 10BaseT adapters, and other vendors not included may offer a full range of competitive products.

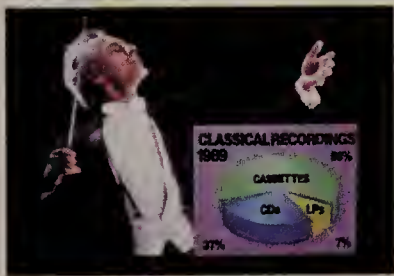
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NETWORK WORLD

10BaseT adapters (continued on page 54)

Vendor	Model	System supported	Bus	Connectors	Software, protocols, interfaces supported	Hub compatibility	Distance to hub	Wiring	LED indicators	Price	Other features/comments
NetWorth, Inc. (continued)	EtherNext for Macintosh II NIC	Macintosh II	NuBus	RJ-45 and AUI	None specified	(1); Cabletron, SynOptics, others	100 meters	Unspecified	None specified	\$449	
Nevada Western (Thomas & Betts Corp.) Sunnyvale, Calif. (408) 734-2600	10BaseT Transceiver	Any with AUI		AUI to RJ-45	Software transparent	(1); others that are 10BaseT-compliant	100 meters	Unspecified	Link status, Signal Quality Error operation, collision, others	\$170	Includes AUI cable
NTI Group Santa Clara, Calif. (408) 739-2180	NTI 1001/DP-T	PC, XT, AT	PC, AT (8 bit)	RJ-45	DOS, TCP/IP, NETBIOS	(1); others that are 10BaseT-compliant	100 meters	Unspecified	None specified	\$350	Drivers included
	NTI 1002/DP-16T	PC, AT	PC, AT (16 bit)	RJ-45	NetWare 286/386, NETBIOS, DOS, OS/2, TCP/IP, DECnet, ULANA (2)	(1); others that are 10BaseT-compliant	100 meters	Unspecified	None specified	\$400	Drivers included
Pivotal Technologies, Inc. Saratoga, Calif. (408) 374-7887	MAUCard Plus (combined adapter and four-port hub)	PC, XT, AT	PC, AT	Four RJ-45s and one BNC	None specified	PC card is a 4-port hub; others that are 10BaseT-compliant	100 meters	Unspecified	None specified	\$499	Active repeater is on PC card; provides a 10Base2 port and four 10BaseT ports
PureData, Inc. Carrollton, Texas (214) 242-2040	PDI-8023-T	PC, XT, AT	PC (8 bit)	RJ-45, AUI and BNC	NetWare 286/386, TCP/IP, VINES, NETBIOS	SynOptics, Cabletron, HP, NetWorth, others that are 10BaseT-compliant	100 meters	IBM Type 3 105 ohm	Network activity, system activity	\$395	Optional NetWare boot PROM
	PDI-8023-T1	PC, XT, AT	PC (8 bit)	RJ-45	NetWare 286/386, TCP/IP, VINES, NETBIOS	SynOptics, Cabletron, HP, NetWorth, others that are 10BaseT-compliant	100 meters	IBM Type 3 105 ohm	Polarity reverse, link integrity, others	\$345	Optional NetWare boot PROM
	PDI-8023-16T	PC, AT	PC, AT (16 bit)	RJ-45, AUI and BNC	NetWare 286/386, TCP/IP, VINES, NETBIOS	SynOptics, Cabletron, HP, NetWorth, others that are 10BaseT-compliant	100 meters	IBM Type 3 105 ohm	Network activity, system activity	\$495	Optional NetWare boot PROM
	PDI-8023-16TI	PC, AT	PC, AT (16 bit)	RJ-45	NetWare 286/386, TCP/IP, VINES, NETBIOS	SynOptics, Cabletron, HP, NetWorth, others that are 10BaseT-compliant	100 meters	IBM Type 3 105 ohm	Polarity reverse, link integrity, others	\$395	Optional NetWare boot PROM
	PDuC-8023-T	PS/2	MCA (16 bit)	RJ-45	NetWare 286/386, TCP/IP, VINES, NETBIOS	SynOptics, Cabletron, HP, NetWorth, others that are 10BaseT-compliant	100 meters	IBM Type 3 105 ohm	Polarity reverse, link integrity, others	\$475	Optional NetWare boot PROM
Racal InterLan Boxborough, Mass. (508) 263-9929	NI5210-10BT	PC, XT, AT	PC, AT (8 bit)	RJ-45 and AUI	NetWare, DOS, VINES, LAN Manager, Xenix, Unix, DECnet/DOS, TCP/IP, NFS	SynOptics, Cabletron, NetWorth, others that are 10BaseT-compliant	100 meters	24 AWG	None specified	\$350	Some drivers are extra
	NI6510-10BT	PC, XT, AT	PC, AT (16 bit)	RJ-45 and AUI	NetWare, DOS, VINES, LAN Manager, Xenix, Unix, DECnet/DOS, TCP/IP, NFS	SynOptics, Cabletron, NetWorth, others that are 10BaseT-compliant	100 meters	24 AWG	None specified	\$395	Some drivers are extra
	NI9210-10BT	PS/2	MCA (16 bit)	RJ-45 and AUI	NetWare, DOS, VINES, LAN Manager, Xenix, Unix, DECnet/DOS, TCP/IP, NFS	SynOptics, Cabletron, NetWorth, others that are 10BaseT-compliant	100 meters	24 AWG	None specified	\$495	Some drivers are extra
	NIA310 Mac-Connect-10BT	Macintosh II	NuBus	RJ-45	AppleTalk/EtherTalk, 3+ Open for Macintosh, NetWare (2.15) for Macintosh, NCSA Telnet	SynOptics, Cabletron, NetWorth, others that are 10BaseT-compliant	100 meters	24 AWG	None specified	\$550	Third-party software support for TCP/IP, DECnet and OSI available
	MicroMAU, MiniMAU	Any with AUI		AUI to RJ-45	Software transparent	SynOptics, Cabletron, NetWorth, others that are 10BaseT-compliant	100 meters	24 AWG	Transmit, receive, link status, others	\$169	MicroMAU has smaller dimensions; MiniMAU has more LED indicators
Standard Microsystems Corp. Hauppauge, N.Y. (516) 273-3100	SMC3008TP	PC, XT	PC (8 bit)	RJ-45 and AUI	NetWare 286/386, LAN Manager, NDIS, VINES, NETBIOS, TCP/IP	SynOptics, Cabletron, NetWorth, others that are 10BaseT-compliant	100 meters	Twisted pair 100 ohm	Transmit, receive, link status	\$325	Software includes a Confidence Test Utility
	SMC3016TP	PC, XT, AT	PC, AT (16 bit)	RJ-45 and AUI	NetWare 286/386, LAN Manager, NDIS, VINES, NETBIOS, TCP/IP	SynOptics, Cabletron, NetWorth, others that are 10BaseT-compliant	100 meters	Twisted pair 100 ohm	Transmit, receive, link status	\$395	Software includes a Confidence Test Utility
	SMC3016-TP/MC	PS/2	MCA (16 bit)	RJ-45 and AUI	NetWare 286/386, LAN Manager, NDIS, VINES, NETBIOS, TCP/IP	SynOptics, Cabletron, NetWorth, others that are 10BaseT-compliant	100 meters	Twisted pair 100 ohm	Transmit, receive, link status	\$450	Software includes a Confidence Test Utility
	SMC3402T Transceiver	Any with AUI		AUI to RJ-45	Software transparent	SynOptics, Cabletron, NetWorth, others that are 10BaseT-compliant	100 meters	Twisted pair 100 ohm	Transmit, receive, collision, others		
3Com Corp. Santa Clara, Calif. (800) 638-3366	EtherLink II TP	PC, XT, AT	PC, AT	RJ-45 and AUI	NetWare, LAN Manager, 3+ Open, DOS, XNS, VINES, NFS, TCP/IP, DECnet	SynOptics, HP, AT&T, others that are 10BaseT-compliant	100 meters	24 AWG	None specified	\$445	Five-pack for \$1,875
	EtherLink/MC TP	PS/2	MCA (16 bit)	RJ-45 and AUI	NetWare, LAN Manager, 3+ Open, XNS, VINES, TCP/IP, others	SynOptics, HP, AT&T, others that are 10BaseT-compliant	100 meters	24 AWG	None specified	\$495	Five-pack for \$2,225

AUI = attachment unit interface
 AWG = American wire gauge
 LAT = DEC's Local Area Transport
 MCA = Micro Channel Architecture
 NDIS = Network Driver Interface Specification

NFS = Network File System
 PDS = Premises Distribution System
 PROM = Programmable read-only memory
 ENMP = Simple Network Management Protocol

FOOTNOTE:

- (1) See 10BaseT hubs/concentrators chart starting on page 58.
 (2) A government specification.

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NETWORK WORLD

10BaseT adapters (continued from page 52)

Vendor	Model	System supported	Bus	Connectors	Software, protocols, interfaces supported	Hub compatibility	Distance to hub	Wiring	LED indicators	Price	Other features/comments
3Com Corp. Santa Clara, Calif. (800) 638-3366	EtherLink TP Transceiver	Any with AUI		AUI to RJ-45	Software transparent	SynOptics, HP, AT&T, others that are 10BaseT-compliant	100 meters	24 AWG	None specified		
Tiara Computer Systems, Inc. Mountain View, Calif. (415) 965-1700	LanCard/E*PC 10BT	PC, XT	PC, AT	RJ-45 and AUI	NetWare 286/386, LAN Manager, 3+ Open, DOS, OS/2, VINES, NFS, TCP/IP, DECnet	10BaseT-compliant	Maximum of 100 meters	Twisted pair unspecified	None specified	\$445	Software includes visual display configuration
	LanCard/E*AT 10BT	PC, XT, AT	PC, AT (16 bit)	RJ-45 and AUI	NetWare 286/386, LAN Manager, 3+ Open, DOS, OS/2, VINES, NFS, TCP/IP, DECnet, Unix, Xenix	10BaseT-compliant	Maximum of 100 meters	Twisted pair unspecified	None specified	\$475	Software includes visual display configuration
	LanCard/E*MC 10BT	PS/2	MCA (16 bit)	RJ-45 and AUI	NetWare 286/386, LAN Manager, 3+ Open, DOS, OS/2, VINES, NFS, TCP/IP, DECnet, Unix, Xenix	10BaseT-compliant	Maximum 110 meters	Twisted pair unspecified	None specified	\$495	Software includes visual display configuration
	Twisted Pair Transceiver	Any with AUI		AUI to RJ-45	Software transparent	10BaseT-compliant	Maximum of 100 meters	Twisted pair unspecified	Transmit, receive, collision, others		Other LEDs indicate jabber, link status and reversed polarity
Ungermann-Bass, Inc. Santa Clara, Calif. (408) 496-0111	Access/PC-8	PC, XT, AT	PC, AT	RJ-45 and AUI	NetWare 286/386, LAN Manager (Net/One), NDIS	(1); HP, Cabletron, BICC, others	100 meters	Unspecified	None specified	\$395	
	NIUpc/EOTP	PC, XT, AT	PC, AT	RJ-45	NetWare 286/386, LAN Manager (Net/One), NDIS	(1); HP, Cabletron, BICC, others	100 meters	Unspecified	None specified	\$1,095	
	NIUps/EOTP	PS/2	MCA	RJ-45	NetWare 286/386, LAN Manager (Net/One), NDIS	(1); HP, Cabletron, BICC, others	100 meters	Unspecified	None specified	\$1,095	
	Access/One TP Access Unit	Any with AUI		AUI to RJ-45	Software transparent	(1); HP, Cabletron, BICC, others	100 meters	Unspecified	None specified		AUI cable included
Western Digital Corp. Irvine, Calif. (714) 932-6000	EtherCard PLUS 10T	PC, XT, AT	PC, AT (8 bit)	RJ-45 and AUI	NetWare, LAN Manager, NETBIOS, NFS, TCP/IP, DECnet, others	David Systems, Cabletron, HP, SynOptics, others	100 meters	AT&T's PDS	Link integrity, polarity, others	\$349	Typically sold only to OEMs; polarity automatically corrected
	EtherCard PLUS 10T/a	PS/2	MCA	RJ-45 and AUI	NetWare, LAN Manager, NETBIOS, NFS, TCP/IP, DECnet, others	David Systems, Cabletron, HP, SynOptics, others	100 meters	AT&T's PDS	Link integrity, polarity, others	\$399	Typically sold only to OEMs; polarity automatically corrected
Zenith Electronics Corp. Glenview, Ill. (708) 391-8000	LAN10TPC	PC, XT, AT	PC, AT (8 bit)	RJ-45 and AUI	NetWare 286/386, LAN Manager, NETBIOS, 3+, OS/2, NFS, TCP/IP, DECnet, VINES	(1), others that are 10BaseT-compliant	Maximum of 100 meters	AT&T's PDS	Link integrity, polarity, others	\$395	Boot ROM socket on board
	LAN10TMC	PS/2	MCA	RJ-45 and AUI	NetWare 286/386, LAN Manager, NETBIOS, 3+, OS/2, NFS, TCP/IP, DECnet, VINES	(1), others that are 10BaseT-compliant	Maximum of 100 meters	AT&T's PDS	Link integrity, polarity, others	\$495	Boot ROM socket on board

AUI = attachment unit interface
 AWG = American wire gauge
 LAT = DEC's Local Area Transport
 MCA = Micro Channel Architecture
 NDIS = Network Driver Interface Specification

NFS = Network File System
 PDS = Premises Distribution System
 PROM = Programmable read-only memory
 SNMP = Simple Network Management Protocol

FOOTNOTE:

(1) See 10BaseT hubs/concentrators chart starting on page 58.

This chart includes a representative selection of vendors in the 10BaseT adapter market. Vendors may offer other 10BaseT adapters, and other vendors not included may offer a full range of competitive products.

SOURCE: MIER COMMUNICATIONS, INC. PRINCETON JUNCTION, N.J.

The twists and turns of Ethernet over twisted pair

Unlike the bus topology of coaxial-based Ethernets, where local stations all interconnect via the same physical cable segment, 10BaseT stations connect in a star topology.

In contrast to the established Ethernet versions that set distance limits — 500 meters for the original Ethernet and 200 meters for Cheapernet — 10BaseT does not specify the maximum distance that workstations can be located from the wiring closet "hub," according to Patricia Thaler, a principal engineer with Hewlett-Packard Co. Thaler, who headed the IEEE 802.3 committee's 10BaseT task force, now chairs the 802.3 committee.

The specification establishes 100 meters as the target minimum distance, Thaler says,

though that is by no means fixed.

In fact, some vendors of twisted-pair cabling — notably AT&T and Belden Wire and Cable Co. — claim that their wiring supports 10BaseT-compliant transmissions at 200 meters.

But Thaler concedes that 10BaseT transmission over some telephone wiring — especially 26 American wire gauge, the smallest diameter phone wire likely to be found — may not support 10BaseT transmission up to the full 100 meters.

According to Thaler, the 100-meter target was based in part on an AT&T survey that found that more than 99% of employee workplaces are situated within 100 meters of a telephone wiring closet.

All 10BaseT stations are connected via two twisted-pair wires — one for transmitting and the other for receiving — over a point-to-point link to a hub that is typically situated in the wiring closet.

The hub must also contain the circuitry to retiming and regenerate the signal received from any of the wire segments that connect at the hub to each of the other segments. A 10BaseT hub, therefore, is an active repeater, as prescribed in earlier IEEE 802.3 specifications.

This is important to note since, per 802.3 limitations, there can be no more than four such repeater regenerations of an Ethernet signal from one end of the local-area network to the other. The 10BaseT hub auto-

matically introduces the first regeneration.

Large Ethernet topologies are somewhat constrained by this limitation. But one way to circumvent this is with bridges, which perform intelligent packet filtering and forwarding based on destination addresses and table lookups. The four-repeater count is effectively set back to zero when packets traverse a bridged link.

The 10BaseT specification does, however, spell out the wiring of the four 10BaseT conductors to the eight-pin connector (which has come to mean RJ-45 in the U.S.), the transmission power levels (which vary depending on the cable's impedance but should be about 2.5 volts) and the data encoding within the signal (self-clocking

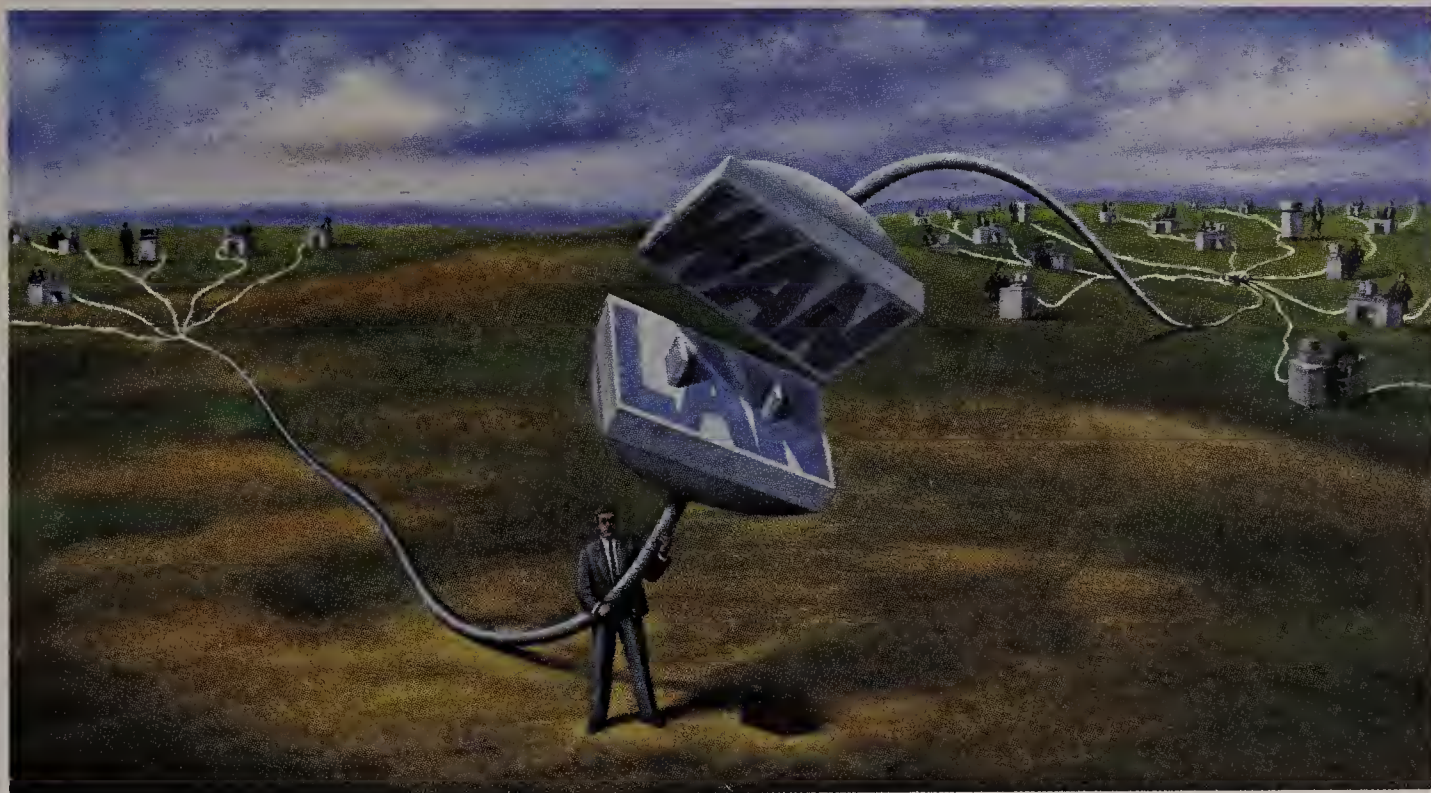
Manchester Encoding, the same as with coaxial-based Ethernet).

Unlike a single coaxial cable segment, the multiplicity of twisted-pair wires in a 10BaseT LAN introduces the propensity for miswiring.

Polarity reversals (between positive and negative) are not uncommon. Nor are reversals of transmit and receive since the receiving pair at one end is necessarily the transmission pair at the other end.

Almost every vendor of 10BaseT adapters and hubs has addressed the issue of miswiring. In many cases, LEDs on the units indicate a problem in the wiring. But there is no requirement that they do this nor any specified method for indicating miswired connections.

— Edwin Mier



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10BaseT hubs/concentrators (continued on page 62)

Vendor	Model	Description	Capacity	Configuration	Special features	Management capabilities	Price
Accton Technology Corp. Fremont, Calif. (415) 226-9800	EN2001-T	12-port concentrator	Supports as many as 12 10BaseT segments via RJ-45 ports	Integral, rack-mountable or table-top unit	None specified	None specified	\$1,099
BICC Data Networks, Inc. Westborough, Mass. (508) 898-2422	Ether-Connect System/4	4-slot system, each slot accommodating a media-line card; media cards available for 10BaseT, IBM Type 1 (shielded twisted pair), 10Base5 (thick coaxial), 10Base2 (thin coaxial) and optical fiber (FOIRL)	As many as 4 Ethernet segments of any mix; each media line card contains an on-board repeater	Rack-mountable	Optional dual power supply	Each concentrator can be managed locally via front-panel keypad and LCD display or remotely from network management station. Features: performance monitoring; fault detection, alarms and triggers; access control; historical and inventory data bases; control of concentrator, line cards and individual ports. Management based on IEEE 802.1 standard.	\$1,595 for enclosure and power supply; media line cards range from \$945 to \$1,895 each
	Ether-Connect System/10	10-slot system, each slot accommodating media line card; media cards available for 10BaseT, IBM Type 1 (shielded twisted pair), 10Base5 (thick coaxial), 10Base2 (thin coaxial) and optical fiber (FOIRL)	As many as 10 Ethernet segments of any mix; each media line card contains an on-board repeater	Rack-mountable	Optional dual power supply	Each concentrator can be managed locally via front-panel keypad and LCD display, or remotely from network management station. Features: performance monitoring; fault detection, alarms and triggers; access control; historical and inventory data bases; control of concentrator, line cards and individual ports. Management based on IEEE 802.1 standard.	\$2,390 for enclosure and power supply; \$945 to \$1,895 each for media line cards
Cabletron Systems, Inc. East Rochester, N.H. (603) 332-9400	Multi Media Access Center (MMAC)	MMAC-3 is a 3-slot chassis enclosure, MMAC-8 has 8 slots; each can hold a 12-port twisted-pair plug-in module; one slot requires an Intelligent Repeater Module, which performs retiming and regenerating for all modules and diagnostics; other single- and multiport media modules are available	As many as 24 twisted-pair segments via 3-slot unit; as many as 84 via the 8-slot chassis	Rack-mountable; twisted-pair modules available with RJ-45, DB-9 or 50-pin telco connectors	Automatic polarity detection and correction in each twisted-pair port; redundant power supply available	LANview network management software permits central-site control of multiple Cabletron units via a graphical Microsoft Windows interface (customer provides console hardware) down to the port level, supports SNMP; otherwise, LEDs indicate link status	\$750 for 3-slot chassis, \$1,340 for 8-slot (includes power supply); repeater modules (one required) range from \$1,675 to \$5,500, depending on amount and degree of management capabilities; \$2,275 for 12-port twisted-pair modules
	MiniMMAC	2-slot chassis accommodates two cards with 6 twisted-pair ports each; port provided for connecting to a backbone Ethernet; other 6-port cards for 10Base2 (thin coaxial/BNC) and optical fiber links, and 4-port card for 10Base5 (AUI) available	As many as 12 twisted-pair segments and 1 connection to backbone	Small chassis, integral power supply	6-port twisted-pair cards come with either RJ-45 connectors or DB-9 (commonly used in IBM Cabling System sites for shielded twisted pair)	Incorporates vendor's remote LANview network management; LEDs indicate link status	\$995 for MiniMMAC chassis, including repeater, power supply and backbone-network connection; \$1,195 each for 6-port Mini Modules
Chipcom Corp. Southborough, Mass. (508) 460-8900	Online System Concentrator	16-slot system housing, each slot accommodating an Online Twisted Pair Module or other module. Available modules include: 8-port module for shielded or unshielded twisted-pair segments, Ethernet repeater, other IEEE 802.3 controllers and management modules	As many as 128 twisted-pair ports per concentrator (using all 16 slots); units can be concatenated for a maximum of 1,024 nodes per network (Ethernet limitation)	Individual 8-port modules are 1 by 10 by 9 inches	Individual segments can run more than 200 meters via shielded twisted pair (such as IBM Type 1); unshielded distances supported to over 150 meters. Interoperable with 10BaseT adapter cards from 3Com, Western Digital Corp. and Racal InterLan	Individual ports are automatically partitioned after 32 failed access attempts. Optional Online Ethernet Management Module is accessed via a terminal.	\$1,600 for 8-port Online Twisted Pair Module
David Systems, Inc. Sunnyvale, Calif. (408) 720-8000	David VolksNet Hub	Stand-alone 12 twisted-pair port hub with an AUI interface (for external transceiver to coaxial Ethernet segment)	To 12 twisted-pair segments, and 1 link (AUI) to coaxial backbone Ethernet	Stand-alone unit, measures 8 by 1.3 by 10 inches	Unit is a full 802.3 repeater	Internal self-diagnostics only	\$1,199
	David ExpressNet Intelligent Hub	Self-contained hub with 12 twisted-pair ports and 1 AUI port (for connection to coaxial backbone via external transceiver)	To 12 twisted-pair segments and 1 link to coaxial backbone Ethernet	Stand-alone unit, measures 8 x 1.3 x 10 inches; can be upgraded to plug into either of the David Intelligent Concentrators	Nonvolatile memory retains configuration	Unit includes physical-layer network management accessed via an RS-232 port	\$2,495
	David ExpressNet 5-slot Intelligent Concentrator	Chassis providing 5 slots, up to 4 can be 12-port twisted-pair modules; a supervisor module is required, providing an AUI port (for connection via external transceiver to a backbone Ethernet) and RS-232 port for network management access; unit is a full 802.3 repeater	Up to 48 twisted-pair Ethernet segments, plus 1 link to coaxial Ethernet backbone, per system	Wall- or rack-mountable unit, measures 13 by 11 by 8 inches	Nonvolatile memory for storage of configuration and statistical information through power failures	Besides integral physical-layer management, an optional network management module can be plugged in; provides in-band network management via SNMP	\$1,200 for chassis unit; \$1,700 for 12-port twisted-pair module; \$1,500 for supervisor module (required); \$795 for optional network management module
	David ExpressNet 12-slot Intelligent Concentrator	Chassis providing 12 slots, up to 11 can be 12-port twisted-pair modules; a supervisor module is required, providing an AUI port (for connection via external transceiver to a backbone Ethernet) and RS-232 port for network management access; unit is a full 802.3 repeater	Up to 132 twisted-pair Ethernet segments, plus 1 link to coaxial Ethernet backbone, per system	Wall- or rack-mountable unit, measures 13 by 11 by 17 inches	Nonvolatile memory for storage of configuration and statistical information through power failures	Besides integral physical-layer network management, an optional network management module can be plugged in; provides in-band network management via SNMP protocols. SNMP management requires 286 system running Windows 3.0, 4M bytes RAM, video graphics adapter display and 20M-byte disk; enables SNMP access across network to other units; software supports alarms, error logs, network maps, reports and statistical logging	\$1,500 for chassis unit; \$1,700 for 12-port twisted-pair module; \$1,500 for supervisor module (required); \$795 for optional network management module
Digital Communications Associates, Inc. Alpharetta, Ga. (404) 442-4000	10BASE Twisted Pair Concentrator	Integral unit features 10 twisted-pair ports (RJ-45 connections), AUI port (for attachment to thick Ethernet via external transceiver) and optical fiber port (SMA 905 or 806 connector)	Connects up to 10 twisted-pair segments to each other, and/or to a coaxial and/or optical fiber Ethernet segment	Rack-mountable unit (2 by 17 by 12 inches) for 19-inch rack	Active repeater is integral	LED indicators on unit for Transceiver Power On/Transmit, Receive/Link Status, Collision, Jabber and Signal Quality Error operation	\$2,200 concentrator list price
Digital Equipment Corp. Maynard, Mass. (508) 493-5111	DECrepeater 350	8-port twisted-pair repeater hub, used with DEC 10BaseT adapters/converters; includes port for connection to Ethernet backbone	8 twisted-pair ports and 1 port for connection to coaxial Ethernet backbone	Stand-alone or rack-mountable	Adapters available for connections to/from IBM 150-ohm Type 1 shielded twisted pair (to 10Base2, 50-ohm coaxial)	LEDs indicate power, link integrity (segment status) and transmission error detection on a segment basis	\$2,200; \$18,700 for 10-pack of repeaters

AUI = Attachment unit interface
FOIRL = Fiber-optic inter-repeater link
IPX = Novell's Internetwork Packet Exchange

LAT = DEC's Local Area Transport
MAC = Media access control
SNMP = Simple Network Management Protocol

This chart includes a representative selection of vendors in the 10BaseT hubs/concentrators market. Vendors may offer other 10BaseT hubs/concentrators, and some vendors not included may offer a full range of competitive products.

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(continued from page 43)

on a large interconnected 10M bit/sec twisted-pair Ethernet can be intelligently managed and nearly three times the bandwidth can be effectively obtained.

Twisting and turning

Even if existing telephone wiring follows the required star configuration and is within the roughly 100-meter distance limitation informally agreed upon in the 10BaseT specification, the wiring still may not be suitable to handle the 10M bit/sec data rates.

No particular wire gauge or type is specified in the 10BaseT standard, although 24 American wire gauge (AWG) is what most equipment vendors have used in tests to confirm that their gear will transmit reli-

ably at up to 100 meters. Much installed telephone wiring is 24 AWG.

More important than gauge, however, are the attenuation (signal loss), impedance (ohms of resistance) and cross talk characteristics of the wiring. Minimally acceptable levels for all of these are spelled out in the 10BaseT specifications. But unless the wiring meets all of these levels, poor or erratic LAN performance could result and maximum transmission distances could be considerably less than 100 meters.

The twisting of twisted-pair wire is key to its effectiveness as the 10BaseT transmission medium. As an unshielded transmission medium, signal energy tends to radiate off unshielded twisted pair,
(continued on page 80)

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Focusing on other 10BaseT products

In addition to the adapters and hub concentrators highlighted in the comparison charts, there are other useful products designed especially for the 10BaseT environment.

One such product is a wire tester offered by Hewlett-Packard Co. and designed to verify the capability of installed wiring to handle 10BaseT transmission. Besides testing the standards-specified parameters, it can be used to troubleshoot and di-

agnose wiring problems after installation. With a price of \$9,500 and a weight of 10 pounds, the unit is neither cheap nor light, but it is one of the few products oriented specifically toward 10BaseT cable evaluation. Similar test units are forthcoming from other diagnostics and test equipment manufacturers now that 10BaseT has been finalized.

A growing number of traditional bridge and router manufacturers have adapted their devices to accommodate 10BaseT local-area network segments. The ACS 4000 Series of bridge/routers from Advanced Computer Communications (ACC), for example, all accommodate 10BaseT adapters and enable large twisted-pair Ethernets to be interconnected over wide areas and permit their logical segmentation at the data-link or network layer.

DECnet and Transmission Control Protocol/Internet Protocol routing are currently supported, and Novell, Inc.'s Integrated Packet Exchange (IPX) is to be added this fall.

Similarly, vendors of 10BaseT hubs that are modular, multiport enclosures are adding modules that provide optional remote bridging, gateway, terminal server and sophisticated network management capabilities.

For example, a remote bridge made by Retix Corp. that occupies two slots in a SynOptics Communications, Inc. hub enclosure will filter and forward packets at the full Ethernet packet rate of more than 15,000 packet/sec at the minimum size of 64 bits over T-1 links.

A gateway unit offered by Ungermann-Bass, Inc. that plugs into the company's modular 10BaseT hub enclosure lets users on a 10BaseT Ethernet communicate with stations on a 4M or 16M bit/sec token-ring network. Token-ring modules can coexist with 10BaseT in the same Ungermann-Bass enclosure, sharing a common power supply and permitting common diagnostics and management.

There are even terminal server modules offered by Hughes LAN Systems (see chart, page 50), which plug into the 10BaseT hub enclosures made by Cabletron Systems, Inc., Chipcom Corp. and SynOptics. These modules each enable as many as eight terminals connected over RJ-45 twisted-pair links transmitting RS-232 data, not 10BaseT, to access the 10BaseT LAN.

Modularity has its place, but the opposite approach — integration of multiple functions into a single-board unit — has been taken by some vendors.

The initial product of one innovative start-up, Pivotal Technologies, Inc. of Saratoga, Calif., is listed in the 10BaseT adapters and hubs/concentrators charts beginning on pages 46 and 58. This is because the MAUCard Plus, a \$499 Personal Computer AT bus plug-in adapter, also contains circuitry and connectors to function as a four-port repeater hub along with an extra BNC port for connection of the hub to a backbone 10Base2 Ethernet.

— Edwin Mier

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NETWORK WORLD

10BaseT hubs/concentrators (continued on page 78)

Vendor	Model	Description	Capacity	Configuration	Special features	Management capabilities	Price
E.I. du Pont de Nemours & Co. Research Triangle Park, N.C. (919) 481-5100	LAN ONE Universal Concentrator and Multiport Repeater Chassis	17-slot chassis accommodates multiport repeater modules (12 ports each) and media-connectivity modules (for shielded, unshielded twisted pair, coaxial, fiber optic, AUI); Ethernet and token-ring modules can co-reside	Up to 60 shielded or unshielded twisted-pair connections via up to 5 Ethernet 10BaseT modules (12 segments each, connected to repeater module over a telco 50-pin connector)	Stand-alone or rack mountable, chassis measures 19 by 10 by 6.5 inches	Dual redundant power supply	Network management functionality can be added via the Ethernet Local Bridge Module and Enhanced Management software; performs segmentation and establishment of redundant links; separate collision-detection module monitors collision activity, accessed by central-site management station (PC with Ethernet adapter); LEDs for activity and collisions	From \$188 per port; specialized modules will boost per-port cost
Farallon Computing, Inc. Emeryville, Calif. (415) 596-9100	PhoneNET StarController Series 500 EN	Integral 13-port unit contains repeater; 13th port provides connection to backbone Ethernet via AUI, fiber, or thin or thick coaxial	To 12 twisted-pair segments and 1 backbone Ethernet link	Wall-mounted, measures 11 by 8.5 by 2 inches	Includes StarCommand network management software	Via StarCommand software; unit also provides 16 LEDs, one per port for activity, plus power, ROM, internal and external RAM indicators	\$2,495
Fibermux Corp. Chatsworth, Calif. (818) 709-6000	FX660X Series of concentrators	Family of 3 multi-slot enclosures, consists of 2-slot (FX6602), 4-slot (FX6604) and 10-slot (FX6600); assortment of line cards support twisted-pair Ethernet (4 ports per card), AUI, shielded twisted pair, fiber, thin coaxial, and 4M or 16M bit/sec token ring; repeater function on each multiport card	From maximum of 8 twisted-pair segments (2-slot unit) to maximum of 40 (10-slot unit)	Each chassis is mountable in 19-in. racks, ranging from 3-in.-high (2-slot) to 12-in. high (10 slot)	Large unit (10 slots) offers optional redundant power supply (other units have integral power); repeater function is distributed, eliminates single point of failure	Optional SNMP-based network management; requires a special SmartLink card and LightWatch software, which runs on PC or Unix workstation (user supplied); port-level monitoring, maintenance	Enclosures range from \$1,050 to \$1,350; have to add cards (vary in price) and power; about \$210 per port if fully configured for twisted pair
Gandalf Data, Inc. Wheeling, Ill. (708) 541-6060	LANline Hub	Integral unit with 13-ports; 12 for twisted-pair Ethernet and one AUI for Ethernet backbone; all ports fully repeatered	Up to 12 twisted-pair Ethernet segments via RJ-45 connections	Small integral unit, weighs about 2 pounds	Links can operate over 22- to 26-gauge American Wire Gauge twisted pair	Unit has LED for power on; each port has LEDs for link integrity (indicates working connection) and jabber	\$1,300
	Access Hub 120 and mini Access Hub	2 enclosure units providing either 10 slots (Access Hub 120) or 4 slots (mini Access Hub); slots accept either 6- or 12-port module, each with own repeater; 5 varieties of twisted-pair module, providing 12 twisted-pair ports and a 13th port that supports AUI, thin coaxial (BNC), 50-pin connector or fiber	To 120 twisted-pair segments via larger unit; to a maximum of 48 with mini Access Hub	Hub 120 is 17 by 19 by 15 inches, rack-mountable and includes redundant power; smaller mini Hub is 17 by 19 by 5 inches	Modules each support 12 BNC (thin coax) or twisted-pair ports; fiber modules provide 6 ports each; each can be inserted or removed while unit is active	With special Ethernet Control Manager module, access is offered to PC-based network management system (purchased separately)	Depending on modules, \$9,000 to \$15,000 for fully configured mini Hub; \$11,000 to \$30,000 for fully configured Hub 120
Gateway Communications, Inc. Irvine, Calif. (714) 553-1555	G/EtherTwist Hub	2-slot enclosure containing 1 or 2 hub modules; hub module provides 11 twisted-pair segment ports (RJ-45) and 1 AUI port for backbone Ethernet connection	Up to 22 twisted-pair Ethernet segments supported in fully expanded hub	External power supply, which is included in price	Interoperability tested with Western Digital, David Systems and SynOptics Communications, Inc.	Most is integral and automatic; intelligence does line checking, automatically disables faulty lines and reinserts restored links (disabling and reinsertion is done when network is idle, so no packets are corrupted)	\$2,295 for minimal configuration, includes 11-port hub, power supply and 1 of vendor's 8-bit PC adapters, adding second 11-port module costs \$1,995; \$3,195 for fully configured (for 22 10BaseT ports)
Hewlett-Packard Co. Roseville, Calif. (916) 785-5000	HP EtherTwist Hub	Self-contained 12-port wiring repeater; small unit, which can be cascaded; media supported includes twisted pair, coaxial and fiber; performs active repeater function	To 12 twisted-pair Ethernet segment connections; number is reduced by any other ports, such as AUI for connection to backbone Ethernet	Wall- or rack-mountable, units are 2 by 17 by 10 inches	Hubs can be cascaded to support more than 1,000 users	HP EtherTwist Hub Plus offered for users needing network management access; permits central-site management by a PC workstation (user supplied) running HP OpenView software; full monitoring and configuration control	Basic 12-port repeater hub is \$1,899; Hub Plus (network management version) costs \$2,299; OpenView management software costs \$1,499
Hughes LAN Systems Mountain View, Calif. (415) 966-7300	LINC/Term TSRV-8 for Cabletron MMAC	8-port terminal-server adapter that plugs into a slot of Cabletron MMAC hub, provides twisted-pair Ethernet access for up to 8 local ASCII terminals, which connect via a twisted-pair adaptation of RS-232 running over from 2 to 5 twisted pairs, RJ-45 connection	Up to 8 terminals connect to a twisted-pair Ethernet via RJ-45 connectors on this terminal-server module; each supported at up to 19.2K bit/sec	Module plugs into an available slot in a Cabletron MMAC concentrator hub; terminals communicate via RS-232 over RJ-45 twisted-pair link	Server module provides TCP/IP and LAT terminal support for attached terminals; server-module software is either downloadable or ROM-based	All operational parameters are configurable from remote site via SNMP; self-test diagnostics accessible remotely (via SNMP) or locally	\$1,395
	LINC/Term 5208 for Chipcom Online	8-port terminal-server adapter plugs into a slot of a Chipcom's Online concentrator, provides twisted-pair Ethernet access for up to 8 local ASCII terminals, which connect via twisted-pair adaptation of RS-232 running over from 2 to 5 twisted pairs, RJ-45 connection	Up to 8 terminals connect to a twisted-pair Ethernet via RJ-45 connectors on this terminal-server module; each supported at up to 19.2K bit/sec	Module plugs into an available slot in a Chipcom Online concentrator hub; terminals communicate via RS-232 over RJ-45 twisted-pair link	Server module provides TCP/IP and LAT terminal support for attached terminals; server-module software is either downloadable or ROM-based	All operational parameters are configurable from remote site via SNMP; self-test diagnostics accessible remotely (via SNMP) or locally	\$1,395
	LINC/Term 3208 for SynOptics LattisNet System 3000	8-port terminal-server adapter that plugs into a slot of a SynOptics LattisNet System 3000 concentrator, provides twisted-pair Ethernet access for up to 8 local ASCII terminals, which connect via a twisted-pair adaptation of RS-232 running over from 2 to 5 twisted pairs, RJ-45 connection	Up to 8 terminals connect to a twisted-pair Ethernet via RJ-45 connectors on this terminal-server module; each supported at up to 19.2K bit/sec	Module plugs into an available slot in a SynOptics LattisNet System 3000 concentrator hub; terminals communicate via RS-232 over RJ-45 twisted-pair link	Server module provides TCP/IP and LAT terminal support for attached terminals; server-module software is either downloadable or ROM-based	All operational parameters are configurable from remote site via SNMP; self-test diagnostics accessible remotely (via SNMP) or locally	\$1,395

AUI = Attachment unit interface
 FOIRL = Fiber-optic inter-repeater link
 IPX = Novell's Internetwork Packet Exchange

LAT = DEC's Local Area Transport
 MAC = Media access control
 SNMP = Simple Network Management Protocol

This chart includes a representative selection of vendors in the 10BaseT hubs/concentrators market. Vendors may offer other 10BaseT hubs/concentrators, and some vendors not included may offer a full range of competitive products.

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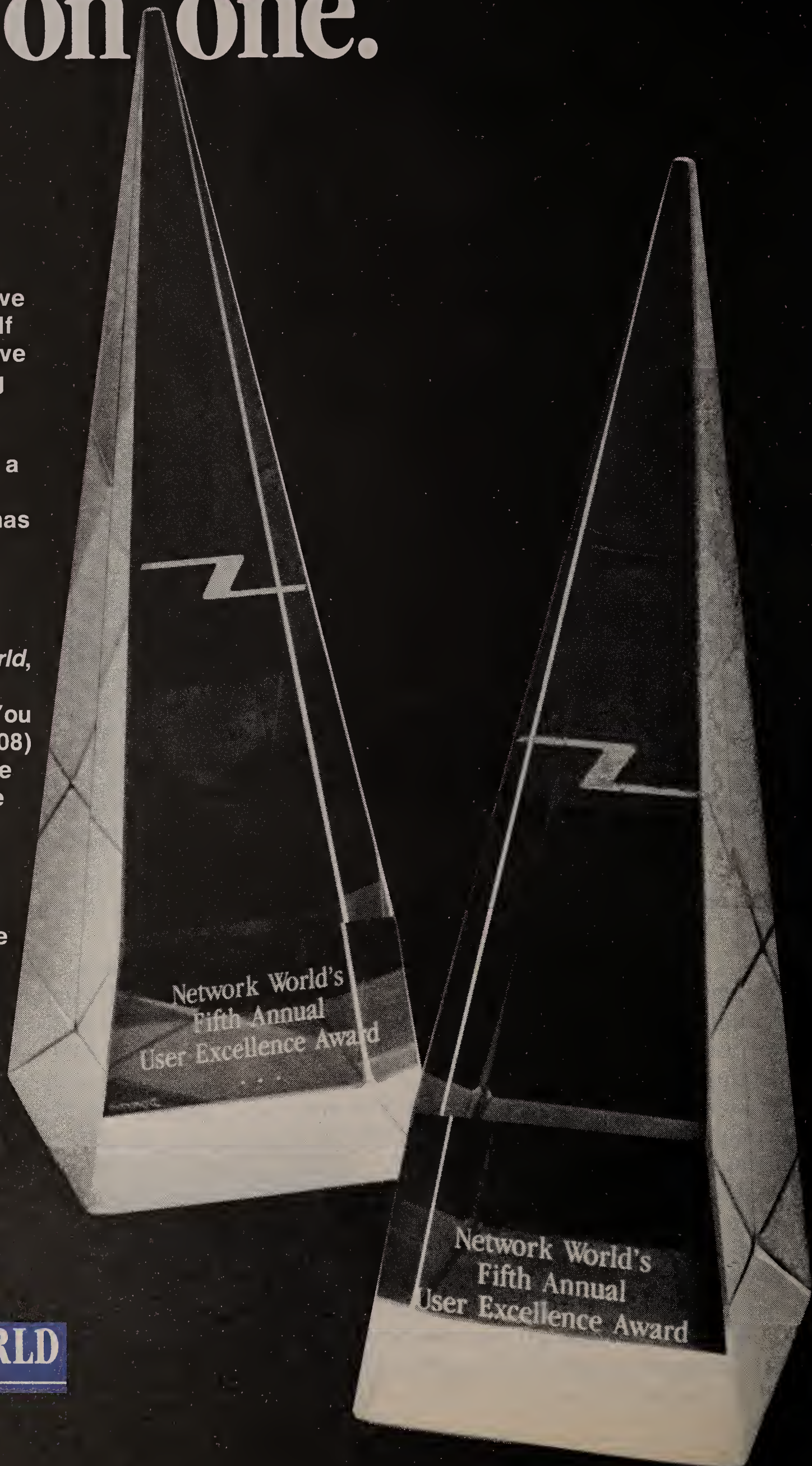
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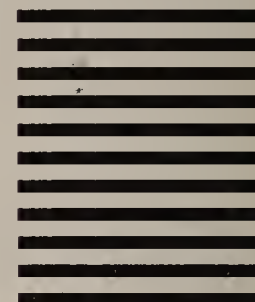
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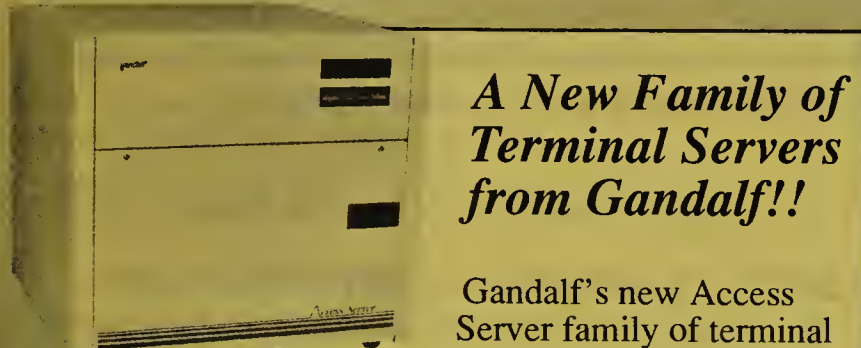
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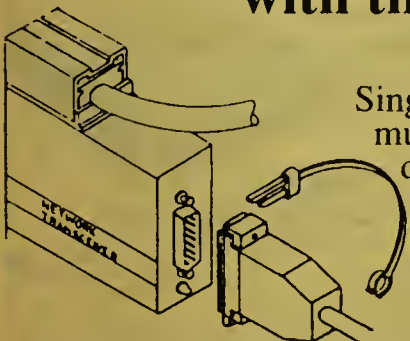
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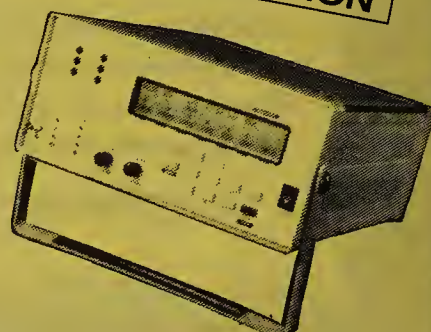
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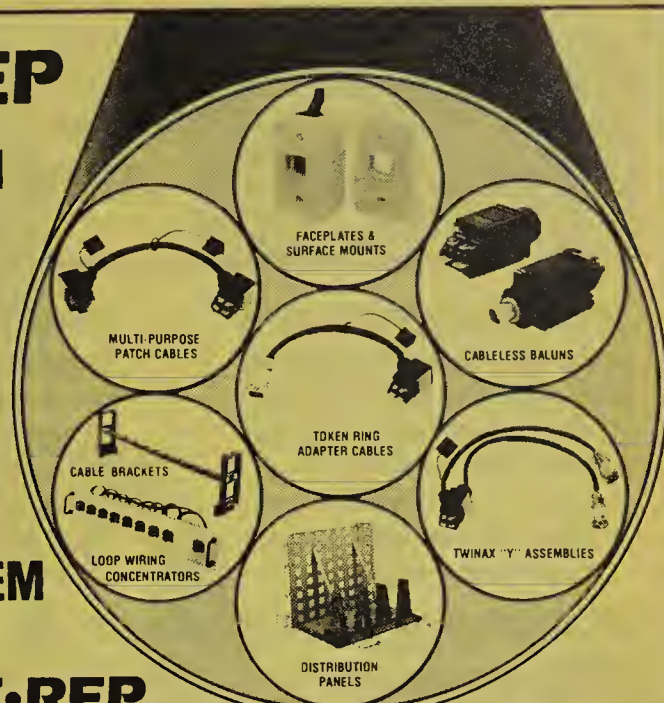
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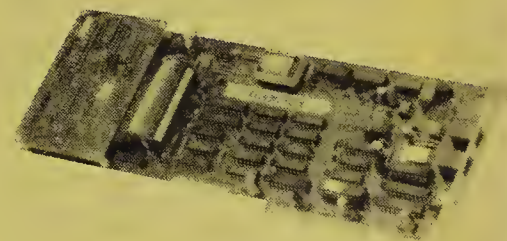
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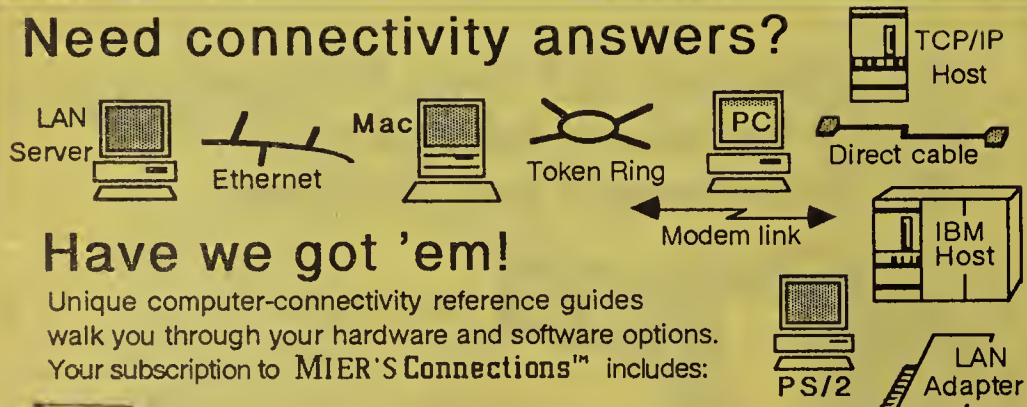
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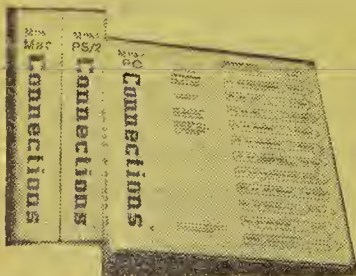
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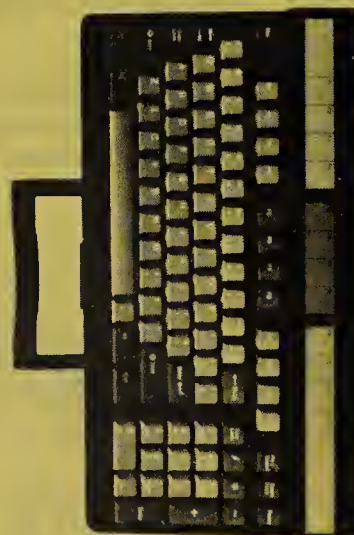
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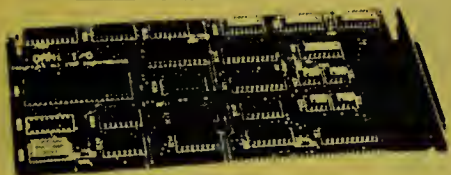


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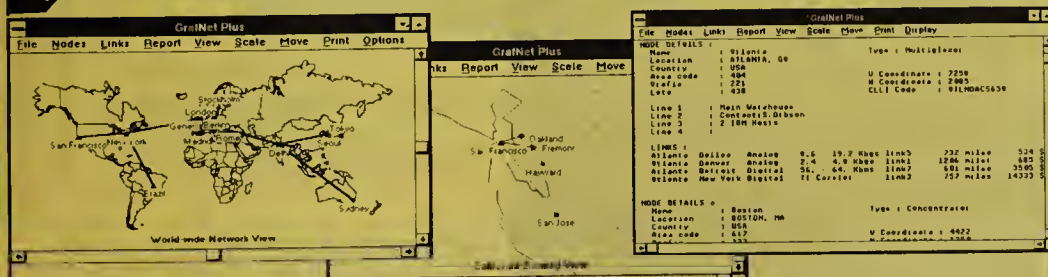
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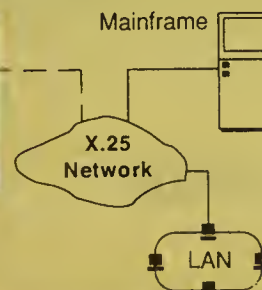
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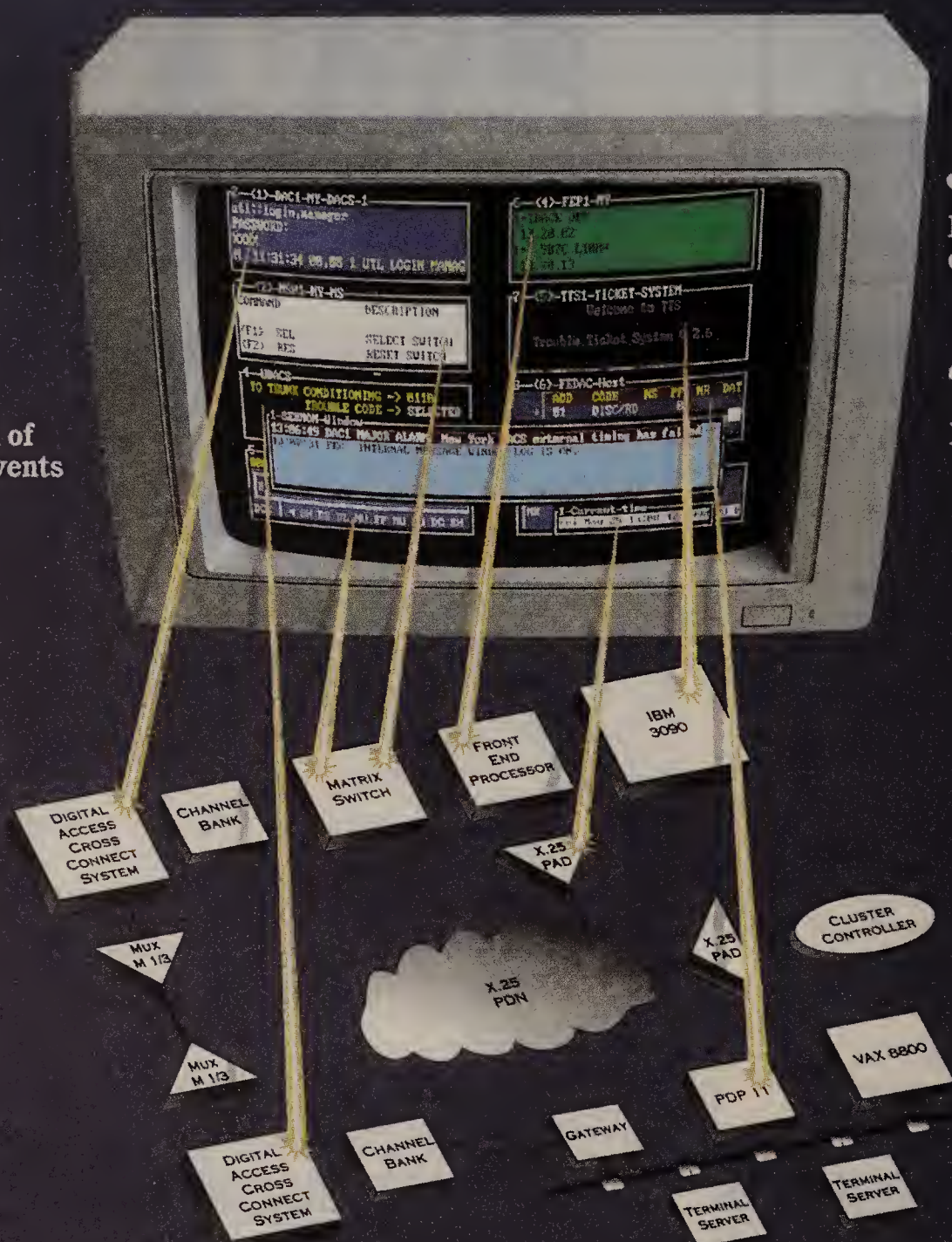
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C. Please Answer ALL Questions, Sign & Date the Form.

1 Industry: (check one only)

- 01. ☐ Manufacturers (other than computer/communications)
- 02. ☐ Finance/Banking
- 03. ☐ Insurance
- 04. ☐ Real Estate
- 05. ☐ Healthcare Services
- 06. ☐ Legal
- 07. ☐ Hospitality
- 08. ☐ Retail/Wholesale Trade
- 09. ☐ Transportation
- 10. ☐ Utilities
- 11. ☐ Education
- 12. ☐ Process Industries (Mining/Construction/Petroleum Refining/Agriculture/Forestry)
- 13. ☐ Government State/Local
- 14. ☐ Government Federal
- 15. ☐ Military
- 16. ☐ Aerospace
- 17. ☐ Consultants (independent)
- 18. ☐ Carriers
- 19. ☐ Interconnects
- 20. ☐ Manufacturers (Computer/Communications)
- 21. ☐ VAR/VAD/Systems House
- 22. ☐ Distributor, Computer Related
- 23. ☐ Distributor, Communications Related
- 24. ☐ Other

2 Job function: (check one only)

- 1. ☐ Networking Management (Responsible for both voice & data)
- 2. ☐ MIS Management (VP, Dir., Department Head)
- 3. ☐ Corporate Management (Chairman, President, Owner, General Manager, CEO, CIO, VP)
- 4. ☐ Data Communications Management (Responsible for data only)
- 5. ☐ Telecommunications Management (Responsible for voice only)
- 6. ☐ Financial Management
- 7. ☐ Engineering Management
- 8. ☐ Consultant (Independent)
- 9. ☐ Other

3 What is the scope of your involvement in purchase decisions for Network/Communications products + services? (check one only)

- 1. ☐ Enterprise Wide (Organization/Subsidiary/Division)
- 2. ☐ Multi Enterprise (Consultants)
- 3. ☐ Department Wide

4 What is the total number of sites for which you have purchase influence?

- 1. ☐ 100+
- 2. ☐ 50 - 99
- 3. ☐ 20 - 49
- 4. ☐ 10 - 19
- 5. ☐ 2 - 9
- 6. ☐ 1

5 Your primary responsibility: (check one only)

- 1. ☐ Both Data + Voice
- 2. ☐ Data Networking Only
- 3. ☐ Voice Networking Only
- 4. ☐ None

6 Which transmission media do you use in your network: (check all that apply)

- Public:
- 01. ☐ Switched-Based
- 02. ☐ Leased Line (not including T-1)
- 03. ☐ T-1
- 04. ☐ Fractional T-1
- 05. ☐ T-3/SONET
- 06. ☐ Broadband (DDD, Wats, Megacom, etc.)
- 07. ☐ ISDN
- Private:
- 08. ☐ Satellite
- 09. ☐ Microwave
- 10. ☐ Fiber Optic

7 Is your network: (check all that apply)

- LOCAL AREA NETWORK
- 1. ☐ Local (within building)
- 2. ☐ Local (in a campus environment)
- WIDE AREA NETWORKS
- 3. ☐ International
- 4. ☐ National
- 5. ☐ Regional (several states)
- 6. ☐ Metropolitan

8 What is your network architecture? (check all that apply)

- 1. ☐ SNA
- 2. ☐ DECNET
- 3. ☐ OSI
- 4. ☐ GOSIP
- 5. ☐ MAP/TOP
- 6. ☐ TCP/IP
- 7. ☐ DCA (UNISYS)
- 8. ☐ OTHER

9 What is your LAN Operating System? (check all that apply)

- 01. ☐ 3COM (3+, 3+ open)
- 02. ☐ LOCAL TALK (APPLETALK)
- 03. ☐ BANYAN (VINES)
- 04. ☐ DCA (IRMALAN)
- 05. ☐ IBM (LAN Server)
- 06. ☐ IBM (PC LAN PROGRAM)
- 07. ☐ MICROSOFT (LAN MANAGER)
- 08. ☐ UNGERMAN BASS (NET/1)
- 09. ☐ NOVELL (NETWARE)
- 10. ☐ TOPS
- 11. ☐ PROTEON (PRONET)
- 12. ☐ OTHER

10 What is your LAN environment? (check all that apply)

- 1. ☐ 4M TOKEN RING
- 2. ☐ 16M TOKEN RING
- 3. ☐ ARCNET
- 4. ☐ ETHERNET
- 5. ☐ STARLAN
- 6. ☐ FDDI
- 7. ☐ LOCALTALK
- 8. ☐ OTHER

11 Which operating systems do you utilize? (check all that apply)

- 1. ☐ IBM DOS (VSE)
- 2. ☐ UNIX
- 3. ☐ OS/2
- 4. ☐ OS/2 Extended Edition
- 5. ☐ MVS
- 6. ☐ VM
- 7. ☐ VMS
- 8. ☐ XENIX
- 9. ☐ PICK
- 0. ☐ OTHER

12 Please indicate by vendor the number of mainframes/minicomputers installed in your network.

VENDOR	MAINFRAMES		MINIS
	A	B	
01. DEC			
02. IBM			
03. AMDAHL			
04. AT&T			
05. BULL HN IS			
06. NCR			
07. DATA GENERAL			
08. WANG			
09. HEWLETT PACKARD			
10. PRIME			
11. TANDEM			
12. UNISYS			
13. CONTROL DATA			
14. OTHER			

13 Please indicate by vendor the number of microcomputers/workstations:

A. Presently installed in your network.

B. The approximate quantity you plan to install in the next 12 months.

MICROCOMPUTER/ WORKSTATION/ VENDOR	PRESENTLY INSTALLED		PLAN TO INSTALL NEXT 12 MONTHS
	A	B	
01. PCs based on 80286 chip			
02. PCs based on 80386 chip			
03. PCs based on 80486 chip			
04. 8086/8088			
05. Macintosh			
06. RISC-based workstations			
07. UNIX-based workstations			

14 What is your planned PC standard? (check all that apply)

- 1. ☐ EISA
- 2. ☐ MCA
- 3. ☐ NUBUS (MACINTOSH)

15 For which areas outside of the U.S. do you have purchasing influence? (check all that apply)

- 1. ☐ Europe
- 2. ☐ Asia
- 3. ☐ South America
- 4. ☐ Australia
- 5. ☐ Middle East

16 Check ALL that apply in columns A and B

A) I am presently involved in the purchase process for the following products/services:

B) I plan to purchase the following products/services in the next 12 months:

Presently Involved	Plan to Purchase	
A	B	
01. <input type="checkbox"/>	01. <input type="checkbox"/>	LOCAL AREA NETWORKS:
02. <input type="checkbox"/>	02. <input type="checkbox"/>	Local Area Networks
03. <input type="checkbox"/>	03. <input type="checkbox"/>	LAN Servers
04. <input type="checkbox"/>	04. <input type="checkbox"/>	LAN Services
05. <input type="checkbox"/>	05. <input type="checkbox"/>	Cables, Connectors, Baluns
06. <input type="checkbox"/>	06. <input type="checkbox"/>	Bridges, Routers, Gateways
07. <input type="checkbox"/>	07. <input type="checkbox"/>	UPS
		LAN Storage Devices
A	B	COMPUTERS/PERIPHERALS:
08. <input type="checkbox"/>	08. <input type="checkbox"/>	Micros
09. <input type="checkbox"/>	09. <input type="checkbox"/>	Minis
10. <input type="checkbox"/>	10. <input type="checkbox"/>	Mainframes
11. <input type="checkbox"/>	11. <input type="checkbox"/>	Front End Processors
12. <input type="checkbox"/>	12. <input type="checkbox"/>	Terminals
13. <input type="checkbox"/>	13. <input type="checkbox"/>	Laptops
14. <input type="checkbox"/>	14. <input type="checkbox"/>	Printers
15. <input type="checkbox"/>	15. <input type="checkbox"/>	Work Stations
16. <input type="checkbox"/>	16. <input type="checkbox"/>	Cluster Controllers

(continued on next column)

Presently Involved	Plan to Purchase	
A	B	
17. <input type="checkbox"/>	17. <input type="checkbox"/>	SOFTWARE:
18. <input type="checkbox"/>	18. <input type="checkbox"/>	Network Management
19. <input type="checkbox"/>	19. <input type="checkbox"/>	Micro to Mainframe
20. <input type="checkbox"/>	20. <input type="checkbox"/>	Network Security
21. <input type="checkbox"/>	21. <input type="checkbox"/>	Call Accounting
22. <input type="checkbox"/>	22. <input type="checkbox"/>	Distributed DBMS
23. <input type="checkbox"/>	23. <input type="checkbox"/>	Communications Software
24. <input type="checkbox"/>	24. <input type="checkbox"/>	Applications Software
25. <input type="checkbox"/>	25. <input type="checkbox"/>	Network Operating Systems Software
26. <input type="checkbox"/>	26. <input type="checkbox"/>	EDI Software
		E-Mail Software
A	B	DATA COMMUNICATIONS:
27. <input type="checkbox"/>	27. <input type="checkbox"/>	Modems (over 9.6kbps)
28. <input type="checkbox"/>	28. <input type="checkbox"/>	Modems (under 9.6kbps)
29. <input type="checkbox"/>	29. <input type="checkbox"/>	T-1 Multiplexers
30. <input type="checkbox"/>	30. <input type="checkbox"/>	T-3 Multiplexers
31. <input type="checkbox"/>	31. <input type="checkbox"/>	Fractional T-1 Multiplexers
32. <input type="checkbox"/>	32. <input type="checkbox"/>	Data Switches
33. <input type="checkbox"/>	33. <input type="checkbox"/>	Matrix Switches
34. <input type="checkbox"/>	34. <input type="checkbox"/>	Packet Switches
35. <input type="checkbox"/>	35. <input type="checkbox"/>	Protocol Converters
36. <input type="checkbox"/>	36. <input type="checkbox"/>	Network Management Systems
37. <input type="checkbox"/>	37. <input type="checkbox"/>	Terminal Emulation Boards
38. <input type="checkbox"/>	38. <input type="checkbox"/>	Facsimile Machines
39. <input type="checkbox"/>	39. <input type="checkbox"/>	Diagnostic Test Equipment
40. <input type="checkbox"/>	40. <input type="checkbox"/>	DSU/CSU
41. <input type="checkbox"/>	41. <input type="checkbox"/>	Data Security
42. <input type="checkbox"/>	42. <input type="checkbox"/>	Data Compression Equipment
43. <input type="checkbox"/>	43. <input type="checkbox"/>	Network Adapter Boards
44. <input type="checkbox"/>	44. <input type="checkbox"/>	Microwave
45. <input type="checkbox"/>	45. <input type="checkbox"/>	Messaging Software
A	B	TELECOMMUNICATIONS:
46. <input type="checkbox"/>	46. <input type="checkbox"/>	PBXs (over 1000 lines)
47. <input type="checkbox"/>	47. <input type="checkbox"/>	PBXs (200 - 1000 lines)
48. <input type="checkbox"/>	48. <input type="checkbox"/>	PBXs (under 200 lines)
49. <input type="checkbox"/>	49. <input type="checkbox"/>	Key Systems
50. <input type="checkbox"/>	50. <input type="checkbox"/>	Automatic Call Distributors
51. <input type="checkbox"/>	51. <input type="checkbox"/>	Voice Messaging Systems
52. <input type="checkbox"/>	52. <input type="checkbox"/>	Video Conferencing Systems
A	B	SERVICES:
53. <input type="checkbox"/>	53. <input type="checkbox"/>	Switched Voice
54. <input type="checkbox"/>	54. <input type="checkbox"/>	Dedicated Leased Line
55. <input type="checkbox"/>	55. <input type="checkbox"/>	T-1
56. <input type="checkbox"/>	56. <input type="checkbox"/>	T-3
57. <input type="checkbox"/>	57. <input type="checkbox"/>	Digital Data
58. <input type="checkbox"/>	58. <input type="checkbox"/>	Packet Switched
59. <input type="checkbox"/>	59. <input type="checkbox"/>	Centrex
60. <input type="checkbox"/>	60. <input type="checkbox"/>	Central Office Lan
61. <input type="checkbox"/>	61. <input type="checkbox"/>	Satellite
62. <input type="checkbox"/>	62. <input type="checkbox"/>	On-Line Information
63. <input type="checkbox"/>	63. <input type="checkbox"/>	ISDN
64. <input type="checkbox"/>	64. <input type="checkbox"/>	E-Mail
65. <input type="checkbox"/>	65. <input type="checkbox"/>	VSAT

17 Estimated value of networking equipment and services:

A: Which you helped specify, recommend or approve in the last 12 months?

B: Which you plan to help specify, recommend or approve in the next 12 months?

- A
- 1. ☐ \$100 million and over
- 2. ☐ \$50 - \$99.9 mill.
- 3. ☐ \$25 - \$49.9 mill.
- 4. ☐ \$20 - \$24.9 mill.
- 5. ☐ \$10 - \$19.9 mill.
- 6. ☐ \$5 - \$9.9 mill.
- 7. ☐ \$1 - \$4.9 mill.
- 8. ☐ \$500,000 - \$999,999
- 9. ☐ Under \$500,000

18 Estimated gross annual revenue of your entire company/institution: (check one only)

- 1. ☐ over \$10 billion
- 2. ☐ \$1 to \$9.9 bill.
- 3. ☐ \$500 to \$1 bill.
- 4. ☐ \$100 to \$499.9 mill.
- 5. ☐ \$50 to \$99.9 mill.
- 6. ☐ \$10 to \$49.9 mill.
- 7. ☐ \$5 to 9.9 mill.
- 8. ☐ under \$5 mill.

19 Estimated number of employees for your entire corporation:

- 1. ☐ over 10,000
- 2. ☐ 5,000 - 9,999
- 3. ☐ 2,500 - 4,999
- 4. ☐ 1,000 - 2,499
- 5. ☐ 500 - 999
- 6. ☐ under 500

20 Which of the following ISDN products do you plan to purchase in the next 12 months? (check all that apply)

- 1. ☐ Basic Rate Interface Terminal Adapters
- 2. ☐ Primary Rate Interface Equipment
- 3. ☐ Voice/Data terminals
- 4. ☐ Voice-only terminals
- 5. ☐ Data-only terminals

21 From which of the following vendors will you consider buying your PBX/Central Office Switch? (check all that apply)

A	B	
PBX	COS	
A <input type="checkbox"/>	<input type="checkbox"/>	AT&T
B <input type="checkbox"/>	<input type="checkbox"/>	ALCATEL
C <input type="checkbox"/>	<input type="checkbox"/>	ERICSSON
D <input type="checkbox"/>	<input type="checkbox"/>	FWJTSU
E <input type="checkbox"/>	<input type="checkbox"/>	HARRIS
F <input type="checkbox"/>	<input type="checkbox"/>	HITACHI
G <input type="checkbox"/>	<input type="checkbox"/>	ROLM
H <input type="checkbox"/>	<input type="checkbox"/>	INTECOM
I <input type="checkbox"/>	<input type="checkbox"/>	MEMOREX TELEX
J <input type="checkbox"/>	<input type="checkbox"/>	MITEL
K <input type="checkbox"/>	<input type="checkbox"/>	NEC
L <input type="checkbox"/>	<input type="checkbox"/>	NORTHERN TELECOM
M <input type="checkbox"/>	<input type="checkbox"/>	SAMSUNG
N <input type="checkbox"/>	<input type="checkbox"/>	SIEMENS
O <input type="checkbox"/>	<input type="checkbox"/>	STROMBERG-CARLSON
P <input type="checkbox"/>	<input type="checkbox"/>	TOSHIBA
Q <input type="checkbox"/>	<input type="checkbox"/>	OTHER

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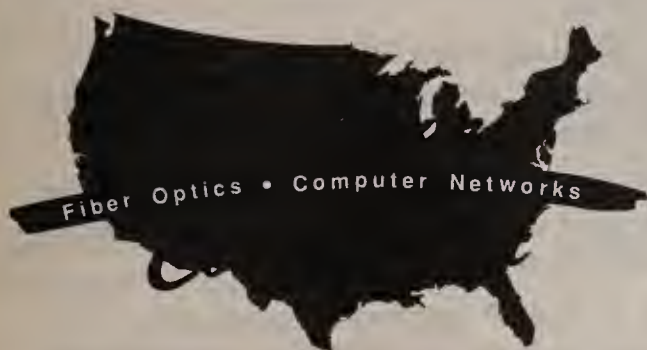
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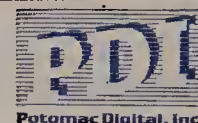


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10BaseT hubs/concentrators (continued on page 80)

Vendor	Model	Description	Capacity	Configuration	Special features	Management capabilities	Price
IMC Networks Corp. Tustin, Calif. (714) 259-1020	PCnic Basket	Enclosure chassis offering 5 slots for twisted-pair or thin-coaxial Ethernet connection; adapter cards each provide 2 BNC or RJ-45 connectors; any mix, each port repeated	Up to 10 twisted-pair Ethernet segments and 1 AUI port for backbone Ethernet connection; up to 30 of these units can be daisy-chained on a coaxial Ethernet backbone	Freestanding, desktop unit, measures 17 by 15 by 4.5 inches	Each BNC port can support a different cable impedance (such as 50, 75, 93 ohm)	LEDs for link integrity, segment partitioning and hub diagnostics	\$1,190 with 2 ports; \$1,975 for fully configured 10-port model
Kaipana, Inc. Los Gatos, Calif. (408) 378-3645	EtherSwitch EPS-700	Stand-alone unit with from 2 to 7 Ethernet ports (twisted-pair, BNC, AUI), switches packets from among any of 7 Ethernet segments; enables large, complex Ethernets to be partitioned in a hierarchical star configuration, effectively yielding a threefold increase in Ethernet bandwidth (to 30M bit/sec)	Does not directly link to 10BaseT workstations, but switches traffic between segments; supports to 1,500 users in a hierarchical multisegment Ethernet; port-to-port packet delay is typically less than 40 microsec.	Stand-alone unit, measures 24 by 16 by 7 inches	Filters and forwards to 15,000 packet/sec on each of up to 7 Ethernet ports; supports up to three 10M bit/sec conversations from twisted-pair hubs	Performs bridge-like routing with near-zero packet delay, and repeater-type regeneration and retiming; self-learning routing tables; SNMP management being developed	From \$4,995 (2 ports) to \$9,995 (fully configured with 7 ports)
L & N Technologies, Ltd. Westlake Village, Calif. (805) 494-4191	LN-10BTC	Integral repeater hub unit providing 12 twisted-pair Ethernet ports and 2 BNC ports (optionally AUI or fiber) for backbone Ethernet network connections; contains active repeater	To 12 twisted-pair Ethernet segments and 2 backbone Ethernet links	Rack-mountable, measures 17 by 13 by 2 inches; power supply included	Vendor also offers 10BaseT transceiver (AUI-to-twisted pair)	LEDs for power, jabber, transmit, receive and collision detection	\$1,595
Lannet Data Communications, Inc. Huntington Beach, Calif. (714) 891-1964	MultiNet LET-36	Active repeater hub in a 36-slot chassis; slots accept 4-port (RJ-45) twisted-pair Ethernet modules, or other modules that support connection to shielded twisted-pair, thick or thin wire, fiber Ethernet segments or token ring (various media)	To 144 twisted-pair Ethernet segments, if fully configured for 10BaseT	For 19-in. rack mounting, 11 inches high	Auto-backup of power supplies; 10BaseT modules feature link fault tolerance (auto backup of links in hub) and automatic pair polarity detection and correction; interoperable with Western Digital, 3Com, Intel Corp., AT&T Cabletron and AMD Co. 10BaseT components, adapters and hubs	SNMP agent contained in a plug-in, optional module; microcontroller sensors in each module; management console is a Unix-based 386 system (available separately); graphical interface; diagnostics to transceiver level, configuration to port level; in- or out-of-band management traffic, transparent to MAC-layer bridges and routers	\$3,800 for chassis unit base; \$795 each for 4-port 10BaseT modules
	MultiNet LET-18	Active repeater hub in an 18-slot chassis; slots accept 4-port (RJ-45) twisted-pair Ethernet modules, or other modules that support connection to shielded twisted-pair, thick or thin wire, fiber Ethernet segments or token ring (various media)	To 72 twisted-pair Ethernet segments, if fully configured for 10BaseT	For 19-in. rack mounting, about 5 inches high	Auto-backup of power supplies; 10BaseT modules feature link fault tolerance (auto backup of links in hub) and automatic pair polarity detection and correction; interoperable with Western Digital, 3Com, Intel, AT&T Cabletron and AMD 10BaseT components, adapters and hubs	SNMP agent contained in a plug-in, optional module; microcontroller sensors in each module; management console is a Unix-based 386 system (available separately); graphical interface; diagnostics to transceiver level, configuration to port level; in- or out-of-band management traffic, transparent to MAC-layer bridges and routers	\$2,000 for chassis unit base; \$795 each for 4-port 10BaseT modules
	MultiNet LET-3	Active repeater hub in a 3-slot chassis; slots accept 4-port (RJ-45) twisted-pair Ethernet modules, or other modules that support connection to shielded twisted-pair, thick or thin wire, fiber Ethernet segments or token ring (various media)	To 12 twisted-pair Ethernet segments, if fully configured for 10BaseT	For 19-in. rack mounting, 1.75 inches high	Auto-backup of power supplies; 10BaseT modules feature link fault tolerance (auto backup of links in hub), and automatic pair polarity detection and correction; interoperable with Western Digital, 3Com, Intel, AT&T Cabletron and AMD 10BaseT components, adapters and hubs	With SNMP module, can be remotely accessed by management console; see above for SNMP-based management	\$900 for chassis unit base; \$795 each for 4-port 10BaseT modules
	MultiNet LER-T	Stand-alone active repeater hub with 12 ports (RJ-45) for twisted-pair Ethernet, and 1 port for connection to backbone Ethernet	To 12 twisted-pair Ethernet segments, and 1 backbone Ethernet connection (AUI)	For 19-in. rack mounting, 1.75 inches high	Automatic pair polarity detection and correction; interoperable with Western Digital, 3Com, Intel, AT&T Cabletron and AMD 10BaseT transceivers and adapters.	Three LEDs per port indicate link integrity and activity	\$1,595
NetWorth, Inc. Irving, Texas (214) 869-1331	EtherNext WorkGroup Hub	Integral repeater unit offers 11 RJ-45 ports for twisted-pair Ethernet connection and 1 AUI port for backbone Ethernet connection	To 11 twisted-pair Ethernet segments and 1 backbone Ethernet connection	Wall-mountable or freestanding, measures 16.5 by 3 by 7 inches	Interoperable with 10BaseT adapters of Western Digital, Cabletron, RacalInterLan, 3Com, Tiara Computer Systems, Inc., SynOptics, David Systems	LEDs indicate traffic, collision and jabber	\$1,995 to \$2,395

AUI = Attachment unit interface
FOIRL = Fiber optic inter-repeater link
IPX = Novell's Internetwork Packet Exchange

LAT = DEC's Local Area Transport
MAC = Media access control
SNMP = Simple Network Management Protocol

This chart includes a representative selection of vendors in the 10BaseT hubs/concentrators market. Vendors may offer other 10BaseT hubs/concentrators, and some vendors not included may offer a full range of competitive products.

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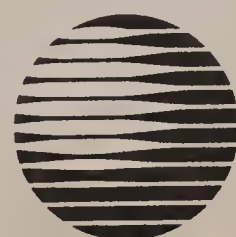
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10BaseT hubs/concentrators (continued from page 78)

Vendor	Model	Description	Capacity	Configuration	Special features	Management capabilities	Price
NetWorth, Inc. (continued)	EtherNext Series 4000	2 versions of concentrator chassis offer 6 slots (Network Command Center) or 3 slots (Departmental Command Center); slots accommodate 10BaseT "host" modules, each providing 12 RJ-45 ports, and optional network management module (with RJ-11/RS-232, RJ-45, AUI and BNC connectors)	To 72 twisted-pair Ethernet segments via Network Center chassis, or to 36 via Departmental Center chassis (no network management module)	Mounts in 19-in. rack; 8-in.-high large chassis, 4.5-in.-high other chassis	Passive backplane; supports connection of 5 independent Ethernet segments	Separate software, EtherManager, runs on LAN manager's workstation, allows diagnostics and management of any 10BaseT port, including alarms, redundancy, topology map; management traffic runs over LAN via Novell IPX protocol	\$1,295 for base Network Center; \$995 for Departmental; \$1,995 for 12-port 10BaseT module; \$2,395 for network management module
Nevada Western Sunnyvale, Calif. (408) 734-2600	10BaseT Hub	Integral 12-port active repeater hub and patch panel; RJ-45 and RJ-11 interfaces; includes AUI port for backbone Ethernet connection	To 12 twisted-pair Ethernet segments and 1 backbone Ethernet connection	Wall- or rack-mountable; measures 8 by 1.3 by 10 inches	Interoperable with adapters from Western Digital, 3Com, Tiara, Racal InterLan and others	Out-of-band network management via any teletypewriter-compatible terminal; monitoring, statistics, port and cable-polarity control, diagnostics and test capabilities	\$2,495; \$2,643 (wall-mountable, with patch panel and cables); \$2,707 (rack-mountable, with panel and cables)
NTI Group Santa Clara, Calif. (408) 739-2180	NTI 3020	Integral concentrator supports 11 ports, which can be twisted-pair Ethernet (or BNC, AUI or fiber)	To 11 twisted-pair Ethernet segments supported	Not specified	Supports 10BaseF fiber specification	Built-in firmware for self-test	\$1,500
Pivotal Technologies, Inc. Saratoga, Calif. (408) 374-7887	MAUCard Plus	PC adapter card is a 4-port, active-repeater hub (in addition to providing 10BaseT interface for PC); also provides coaxial (BNC) port for connection to an Ethernet backbone network	To 4 twisted-pair Ethernet segments and 1 connection to a 10Base2 Ethernet backbone	Adapter card plugs into a PC AT bus	Unique packaging of hub, for work groups of 5 or fewer 10BaseT nodes	None specified	\$499
Standard Microsystems Corp. Hauppauge, N.Y. (516) 273-3100	SMC3508TP	Integral 8-port (RJ-45) concentrator, plus a ninth port for connection to backbone Ethernet (choice of AUI, RJ-45, BNC, or dual ST fiber connectors)	To 8 twisted-pair Ethernet segments and 1 connection to backbone Ethernet	Unit mounts in a 19-in. rack; measures 17 by 2 by 11 inches	Supports shielded or unshielded cabling for 10BaseT device connection	Includes 10BaseT physical-layer network management: automatic port/segment partitioning and reconnection, jabber lockup protection, link integrity test for automatic line checking; 2 LEDs per port for link-integrity status and transmit-source indication	\$1,195
SynOptics Communications, Inc. Mountain View, Calif. (415) 960-1100	LattisNet Model 3000 Concentrator	Modular chassis with slots that accommodate adapter modules for shielded or unshielded twisted-pair or optical-fiber Ethernet, or 4M/16M bit/sec token ring (shielded and unshielded cable), or optional remote bridge or network management modules	To 132 twisted-pair Ethernet segments (fully configured for 10BaseT)	Rack-mountable or table top, unit measures 19 by 19 by 12 inches	Interoperable with adapters from 3Com, Western Digital, Racal InterLan and Tiara; interconnect ports are configurable	LattisNet Network Management requires optional module and DOS-based management console running vendor's Windows-based software; real-time diagnostics, MAC-layer statistics	\$42,795 for 132-port configuration; \$47,195 with Network Management
	LattisNet Model 2310-01 Area Concentrator	Fixed 36-port concentrator unit with AUI port for connection to backbone Ethernet	To 36 twisted-pair Ethernet segments and 1 connection to backbone Ethernet	Wall- or rack-mountable or table top, unit measures 17 by 15 by 5 inches	Interoperable with adapters from 3Com, Western Digital, Racal InterLan and Tiara	Standard LattisNet Network Management Release 2.1 built-in; MAC-layer statistics, real-time diagnostics	\$12,495 (or \$347 per port)
	LattisNet Model 2800 Workgroup Concentrator	Fixed 12-port concentrator unit with AUI port for connection to backbone Ethernet	To 12 twisted-pair Ethernet segments and 1 connection to backbone Ethernet	Wall- or rack-mountable or table top, unit measures 17 by 12 by 2.5 inches	Interoperable with adapters from 3Com, Western Digital, Racal InterLan and Tiara; front-panel accessible internal power supply	Minimal; standard LattisNet management capabilities not supported	\$1,795 (or \$1,508 per 10BaseT port)
Ungermann-Bass, Inc. Santa Clara, Calif. (408) 496-0111	ASM-310 Access/One 10BaseT Concentrator	12-port twisted-pair module plugs into slot of vendor's 5-slot or 11-slot enclosure (ASE-3000 or ASE-7000, respectively); each contains repeater; modules that enable interconnection with other Ethernet segment types available	Up to 48 twisted-pair segments in the 4-slot enclosure; up to 120 using the 11-slot (1 slot required for supervisor module)	Either enclosure is wall- or rack-mountable; 24 by 8 by 15-inches 5-slot unit; 23 by 19 by 12-inches 11-slot chassis	Besides modules for twisted-pair and all other Ethernet types, which can be interconnected, modules for many other network connections are available and coexist in same unit (sharing power, common management); these include LocalTalk, token ring, FDDI	Supervisor module provides expanded management via a DOS PC console (supplied by customer, software available from vendor); each hub module has LEDs for indicating wiring faults, jabber, hub segmentation and collision conditions (too many or too long)	\$2,095 for 5-slot and \$2,495 for 11-slot enclosures; \$2,500 for 12-port hub concentrator; \$3,350 or \$4,550 for supervisor module (two versions); other Ethernet modules: \$2,345 (10Base2), \$2,850 (fiber repeater link) and \$4,550 (buffered repeater, similar to bridge but without filtering); other modules from \$4,695 for LocalTalk to \$25,000 for FDDI
Zenith Electronics Corp. Glenview, Ill. (708) 391-8000	Enterprise Exchange	2 versions of modular concentrator chassis with 3 slots (EE-C3) or 18 slots (EE-C18); slots accommodate assortment of modules, including 4-port 10BaseT, shielded twisted pair, and optical-fiber Ethernet, and token ring (shielded and unshielded); separate monitor, management and repeater modules	To 64 twisted-pair Ethernet segments in larger unit; to 12-in. smaller unit (if fully configured for 10BaseT connections)	Both units rack-mountable; 19 by 11 by 5 inches and 19 by 11 by 2 inches	Automatic switch over to backup power supply	Basic diagnostic capabilities are integral via LEDs; optional network management software allows centralized monitoring and control of units and individual modules from a workstation (customer provided); software currently proprietary, but SNMP is under development	\$990 for 3-slot enclosure, \$2,190 for 18-slot; \$795 each for 4-port 10BaseT modules

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FOIRL = Fiber optic inter-repeater link
IPX = Novell's Internetwork Packet Exchange

LAT = DEC's Local Area Transport
MAC = Media access control
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SOURCE: MIER COMMUNICATIONS, INC., PRINCETON JUNCTION, N.J.

(continued from page 60)

especially as the frequency of the transmitted signal increases.

The 10-MHz frequency of 10BaseT transmission is substantially higher than the 1- to 3-kHz frequency band used by analog voice transmission. And signal energy is, therefore, much more prone to radiate off the wire. (Shielding helps hold this energy in and also serves the function of repelling extraneous electromagnetic energy that can corrupt the signal being transmitted.)

Subsequently, 10-MHz signal energy — and to a lesser extent, signal energy at harmonics of 10 MHz — is lost as the signal propagates along the wire. This loss reduces the distance that the signal can be reliably transmitted and received, but it also causes cross talk on adjoining and nearby wire pairs.

Telephone wires are twisted to minimize the effects of loss and cross talk. Twisting helps prevent high-frequency signal energy from radiating to and corrupting

the 10BaseT signal being carried over nearby twisted pairs. Even the individual wire pairs in thick 25-pair telephone cable are twisted.

This cable is widely used in and around 10BaseT hubs, as it enables as many as 12 10BaseT segments to be neatly carried and patched using the common 50-pin connector.

One 10BaseT vendor, Gateway Communications, Inc., advises that there be a minimum of one twist per foot, regardless of

the wire gauge used. In addition, according to Gateway Communications, pairs must not be paralleled in the lay of the cable, and pair polarity must be observed.

Price per node

As competition heats up, users can expect a drop in the current per-node price for a 10BaseT connection — now about \$150 to \$200 per hub port, plus about \$400 per workstation adapter. For example, while most personal computer adapters for 10Base-

T also still include a port for connection to a coaxial-cable Ethernet — via attachment unit interface (AUI) cable or BNC connector — more boards with just 10BaseT RJ-45 connectors are appearing. This pares off some of the added production costs.

Another alternative is to use a workstation's existing Ethernet adapters and plug one of the small 10BaseT transceiver units into the existing BNC or AUI port. As shown in the adapter chart, a

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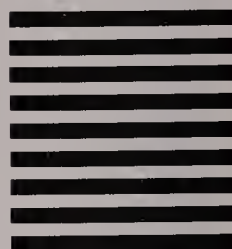
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Net strategist offers insights to managers

continued from page 22

products and flattening management layers.

How can net managers justify investments in strategic projects when they are under pressure from top management to cut costs?

Network managers need to be seen as hard-nosed guardians of top management's self-interests. They can do that by measuring costs, tracking benefits and keeping a tight rein on the direction of the department. And when expected benefits don't materialize, net managers should explain what they're doing about it. That's what builds credibility and makes senior executives more amenable to strategic projects.

It's easy to justify things on the basis of costs and savings, but that's not the trend today. CEOs really want to know the impact a project will have on the company's earnings per share and what value-added benefits it will bring. Companies can save themselves into bankruptcy.

Network managers have been told repeatedly to align technology with corporate objectives, but how exactly can they do that?

Telecom people need to know why their company's products sell vs. their competitors'. They need to know how new networking-based products could garner competitors' market share. Few net managers know these things.

They have to put themselves in the uncomfortable position of getting more involved in the field operations of the company. They have to demonstrate that their allegiance is to their company and not to technology. This means they should learn how to sell insurance, work as a bank teller, sell merchandise, manage a loading dock or whatever goes into making the business a success.

I would like to see TCA or other professional associations try to emphasize the applications or benefits technology can bring rather than the technology. Telecommunications managers need to acknowledge that they're being held back by their own profession, which is oriented to technology.

Once they focus on the business instead of technology, they will begin to make progress and gain credibility.

How can net managers improve their relationship with vendors and establish a true partnership?

There are lots of vendors with whom you really can't have a true partnership. Certain vendors will exploit the willingness of customers to work closely with

wide spectrum of these transceiver units, most currently for AUI connector or AUI cable connection to a 10BaseT RJ-45 port, are priced between \$125 and \$175.

A disadvantage to widespread use of the transceiver adapters is that 10BaseT adapters usually have intelligence for remote diagnostics and management. However, the management packages that are offered are almost all vendor-proprietary.

And until standardized management protocols are more widely supported, comprehensive central-site management of a mixed-vendor 10BaseT network will remain an elusive dream. ■

them. Users as well as vendors must recognize that partnerships are developed over the long term, and each side must be reminded of the benefits of the relationship. The relationship also needs to be strong enough to survive changes in each company's management. True partnerships can provide enormous benefits, but the relationship has to be managed carefully.

How can net managers increase the productivity of their staffs?

I would like to see managers rotate jobs and leadership positions much more. When you expose people to different job responsibilities, they are more likely to see the larger purpose of their job and suggest innovative ideas and recommendations for improving operations. ■

Boards give bridges 4-to-1 compression

continued from page 17

\$2,799 and will ship next month.

Microcom also announced that it will offer 2-to-1 compression capabilities for local-area network data routed over X.25 connections in its MLB6500 bridge.

Sterry said this will make X.25 connections more attractive than private-line options because X.25 users will be able to reduce packet charges. A 100K-byte file that usually requires 1,000 packets is reduced to 500 packets through the compression techniques, he added.

One drawback, initially, is that users must dedicate a separate MLB bridge for the X.25 interface because they cannot

mix X.25 interfaces in the same bridge with integrated local and remote links. The X.25 compression upgrade is available in a software option that costs \$495 or a hardware interface that costs \$1,899.

Microcom also announced a software upgrade for its MLB bridges that enable the bridges to support LAN and wide-area network interface cards in the same unit. Users now have the option of connecting three local LANs with one bridge or connecting two LANs and two remote links without the expense of purchasing and maintaining separate units.

Microcom said the enhancement also enables users to manage local and remote LAN connections from a single point.

The new bridge software costs \$495 and is expected to ship next month. ■

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DEC LAN Bridge 150	24,272/13,404	NO	\$6,500	\$1,562
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Net undergoes LAN restructuring

continued from page 1

that rate, it expects to exceed the minicomputers' capacity within a year, Beckley said.

Compounding the problem is the hospital's desire to provide the staff with even greater access to on-line patient information. By the mid-1990s, the hospital would like to have about 4,000 end-user devices in service, Beckley said.

Recognizing the limitations of its existing system, the need for an expandable systems architecture and the desire to support new types of end-user applications, Brigham and Women's set out searching for alternatives to its DG minicomputers.

Although more modern minicomputers could meet the hospital's short-term capacity requirements, Brigham and Women's finally decided that LANs supporting microcomputers in a client/server architecture would best meet its needs.

Besides providing almost limitless expansion capabilities, the LAN-based system will enable the hospital to replace its dumb terminals with workstations that offer a graphical user interface with pop-up windows and pull-down menus, Beckley said.

The extra processing power will also enable the hospital to deploy rules-based applications to aid in health care decision making. Those applications, for example, could inform doctors if medications patients are taking would affect certain lab results.

"We could never have spared the processing power to run such rules-based analyses with our minicomputers," Beckley said.

The network architecture the hospital has devised — and will deploy over the next three years — calls for the installation of about 50 departmental 4M bit/sec token-ring networks supporting about 2,000 IBM Personal System/2 Model 55s and diskless Model 25 microcomputers.

The departmental networks will be extended into the hospital's data center via

fiber and linked there to two 16M bit/sec token-ring backbone nets, one used primarily to support clinical applications and the other to be used for administrative applications.

Clinical backbone

Many of the departmental LANs will be linked to the clinical backbone through two IBM PS/2 Model 80s configured as server/routers and used to support laboratory, pharmacy, admission and other applications. Each server, one of which backs up the other, will support 2G bytes of disk storage.

The server/routers will run an operating system called MIIS, a dialect of the ANSI MUMPS operating system that originated in the health care industry.

MIIS is a multitasking, multiuser operating system that runs above DOS and comes with an integrated data base. MIIS boasts a robust Network Basic I/O System

“We could never have spared the processing power to run such rules-based analyses with our minicomputers.”



interface that will enable the hospital to build the network without adding a separate network operating system. Workstation clients will also run MIIS.

The majority of the MIIS servers will be dedicated to supporting a single application. When health care providers initiate requests from machines on departmental LANs, the MIIS server/routers will satisfy the requirement or route it across the backbone to the appropriate server, Beckley said.

The departmental LANs will also be linked to data center PS/2 Model 80 servers that support administrative applica-

tions, such as spreadsheets and word processing, and will be connected via bridges to the second 16M bit/sec token-ring backbone.

This backbone will run IBM's LAN Server network operating system and enable users to access DOS programs stored in their department's OS/2 server or in OS/2 servers in other departments.

The second backbone is needed so administrative traffic will not degrade the performance of the clinical network, said Jim Mara, technical designer at Brigham and Women's.

"We don't want large DOS file transfers to have any effect on the response times of the MIIS network used by physicians [and] nurses," Mara said.

Migration

The migration from the DG machines to the personal computer network is being facilitated by the use of a homegrown gateway used to link the new network to an Ethernet LAN supporting the DG minicomputers.

During the migration, the microcomputer servers will be used to back up the minicomputers using a "journaling" process supported by MUMPS. Over time, the DG minicomputers will become the backup units to the microcomputer servers and then eventually be eliminated.

According to John Glaser, vice-president of information systems at Brigham and Women's, the first minicomputers will be decommissioned in 1½ years. The migration is expected to be completed within three years.

Glaser said the \$7.5 million project is equivalent to what the hospital would have spent to build a new minicomputer network. It is also about equal to the cost per end user of the existing system, which is about \$3,100.

The LAN, however, provides more than twice as much horsepower as the existing minicomputers. Glaser said the current minicomputers can process approximately 600 million instructions per second (MIPS); the new net will handle about 1,300 MIPS. □

Law firm moves its operation to PC LAN

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such as The National Law Journal's docket calendaring software.

Micro One, a Dallas systems integrator, is installing the network, the first phase of which — the installation of 150 nodes — is complete. The rest of the equipment is scheduled to be installed by year end.

The rationale for the network is twofold: timing and economics. Proskauer & Rose recently moved its practice from Park Avenue to Broadway and, in the process, wanted to equip the office with a more cost-effective way to access documents.

Word processing is Proskauer & Rose's primary desktop application. All of the firm's documents and data will be stored on the six file servers so an attorney can create, store and retrieve documents on any file server. Each personal computer has its own printer.

"The new network will significantly speed up the process of getting documents," Sforza said. "That alone is a strong impetus to get on-line."

Previously, lawyers had to dial into a data base using modems in order to retrieve a client's billing report. Now they can conduct inquiries into accounts from the personal computer on their desk. Accessing the information themselves will save the firm time and money, Sforza said.

Another time-saving application is litigation support, which allows attorneys to input deposition transcripts and full text or abstracts produced during the legal fact-finding process into an on-line relational data base. Proskauer & Rose is using a combination of data base products, including Microsoft Corp.'s SQL Server and Novell's Btrieve, as well as Borland International, Inc.'s Paradox and products from Oracle Corp.

"Some cases have thousands of documents, and having all of those documents in a data base makes any information a lawyer needs much easier to locate," Sforza said.

He noted that litigation support software also saves money because it lets the firm store all documentation in-house, instead of hiring clerks, as it did previously, to locate depositions and other documents relating to a case.

Lawyers can manipulate the full-text data base in many ways: They can search by key words, topics, names or dates. They can even mark places in the text relating to certain points of evidence and later call up those portions. Any lawyer can access points marked by someone else.

Attorneys at Proskauer & Rose will also be able to access on-line data bases such as Lexis and Westlaw from their desks. Previously, they had to wait in line to use a few shared terminals in the firm's library.

Elizabeth Williams, a technology consultant for Altman & Weil, a Philadelphia-based management consultancy, said that although Proskauer & Rose's network is state-of-the-art in terms of its size, such networks are not as unusual in law firms as they once were.

"Law firms have a tremendous amount of information to store, but they've traditionally been slow to adapt to new technologies," Williams said. "Many law firms still use proprietary word processing environments but are slowly moving toward open architecture environments, which open them up to a range of applications, both for administrative functions and, more importantly, for attorney applications." □

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The data professionals at Blue Cross and Blue Shield of Oregon are so good at processing health insurance claims, Medicare asked them to do a large portion of theirs.

"That meant putting together a complex yet economical network—and fast," according to Teleprocessing Manager Vince Gambino. "We had to tie 13 locations, from Pennsylvania to Texas, into our Portland mainframe via Medicare mandated point-to-point circuits. It had to accommodate on-line interactive communications and massive batch files, and take advantage of the AT&T diagnostic and management features in our existing network."

Gambino and Blue Cross and Blue Shield of Oregon turned to ADCom. Together they developed a network that transmits analog and digital data via T1 lines with analog and digital extensions that tie into the existing network management system for central site maintenance and control.

See The FAXNet Form on Page 59

"Not only did ADCom get us the equipment at prices attractive enough to put together a successful bid to Medicare," Gambino noted, "no one else could have provided us the exacting support we needed to get the network up and running in time."

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Bringing frame relay into focus

continued from page 1

According to Modahl, one of the first things users have to do is separate frame relay from fast packet. Frame relay is simply a data link-layer protocol that defines how frames of data are assembled and how they are routed through a packet network. It is designed to provide higher performance than other wide-area packet-switching technologies, making it a viable alternative for supporting bursty, high-volume data traffic such as LAN-to-LAN links.

Performance gains promised by frame relay could make packet technology more attractive to users that currently employ circuit-switching technology to support high-bandwidth applications.

Frame relay only defines how data is presented to a network switch. Fast packet, on the other hand, defines a switching architecture that can handle frame relay packets or other forms of packet data, said Nick Lippis, a principal with Northeast Consulting Resources, Inc. in Boston.

"Frame relay is not a switching architecture or a switching technology at all," Lippis said. "It's really just an interface that gives you access to a certain switching fabric."

An improvement over X.25

Frame relay closely parallels X.25 technology but offers significant performance enhancements over X.25. "It's a lot like X.25, but it's simpler by about an order of 10," said Brian Button, StrataCom, Inc.'s product line manager for packet mode services.

For instance, frame relay has a total of 48 bits of overhead, which is four to five times less than the implementations of X.25 on the market today, according to analysts.

This overhead includes a 16-bit address and control field that is used to route data through the network, as well as a cyclic redundancy check error-checking mechanism and flags that signal the beginning and end of each frame.

By streamlining the X.25 protocol, frame relay enables switches to operate much faster and enables users to send data to the switches faster. For instance, frame relay enables users to send data to frame relay-based switches at T-1 speeds, while most X.25 implementations are limited to a top speed of 64K bit/sec.

Frame relay is so named because it defines how frames get relayed across a series of predefined connections between switches. This means that all frames in a single transmission will remain in order as they traverse the same set of network links. X.25, on the other hand, routes packets over a mix of different links, which often means that packets must be reordered by the receiving device.

Both ANSI and the Consultative Committee on International Telephony and Telegraphy are working to define a frame relay standard. ANSI is working out final details and should publish its standard early next year, said Gail Smith, principal product manager for Codex Corp. and former chairman of ANSI's T1S1 committee, which is drafting the standard. CCITT is expected to publish its standard in 1992.

Frame relay was initially being developed to spark interest in Integrated Services Digital Network services by enabling ISDN to support packet data, said John McQuillan, president of McQuillan Con-

sulting in Cambridge, Mass.

"Then private networking vendors started looking at frame relay as a quick and dirty way to get better performance on packet networks," he said.

Private network vendors are now lining up to develop frame relay interfaces for their LAN bridges, routers and T-1 multiplexers. Those products will act essentially the way an X.25 packet assembler/disassembler functions to shuttle frame relay data to packet switches or central office switches outfitted to support frame relay.

After receiving a frame, the switch examines an 11-bit Data Link Connection Identifier (DLCI) to determine the frame's destination and then sets up the connections between switches.

The DLCI creates a permanent virtual

circuit that mimics a leased line between devices. This virtual circuit defines a specific path for all frames to follow between any two devices.

For devices that communicate infrequently, managers may want instead to create a switched virtual circuit, a function already supported in X.25.

ANSI is calling for the use of the ISDN Q.931 signaling protocol to create switched virtual circuits. With Q.931, the frame relay interface will send signaling data over an ISDN D channel that instructs an ISDN switch to set up a connection between the two nodes. That connection is then torn down when transmission of all frames is completed.

Frame relay also eliminates the need to check packets for errors as they are passed

from switch to switch in the network. Instead, only the switch that receives frames from a sending device and the one passing frames to the receiving device check frames for errors. If a frame has an error, the switch simply discards it.

Because frames with errors are destroyed, frame relay requires data terminal equipment to use a transmission protocol that tells the sending device to resend absent frames. It also requires the use of digital circuits that are less likely to introduce errors into the data stream than analog circuits.

Frame relay also includes a congestion control feature, which enables a switch that is close to reaching its frame processing capacity to tell devices to slow the rate at which frames are forwarded to it. ■



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THE POWER IS ON

Stigma keeping users wary

continued from page 5

customers as potential 900 service users.

AT&T's efforts to educate large accounts about emerging applications for 900 services have been paying off, said Andrea West, national marketing manager for AT&T's MultiQuest 900 services.

One recent AT&T "snapshot" study showed that 40% of new MultiQuest 900 service applications were for business purposes, compared to 7% in January, she said.

Large users such as Lotus Development Corp., McDonald's Corp. and The Pratt & Whitney Company, Inc. are offering 900 services.

Lotus, for example, is rolling out a new customer support program that lets users of its 1-2-3 spreadsheet products talk to technical specialists via a 900 number, rather than pay \$79 for a standard support contract.

Under the 900 number arrangement, if Lotus does not connect the customer with a technical specialist within a minute, Lotus will call the customer back "on our nickel," said Jim McMullen, director of customer support at Lotus in Cambridge, Mass.

"We wanted to provide customers with an alternative to subscribing to our regular support service on an annual basis," McMullen said.

The question still lingers

But many users question whether 900 services would do their company more harm than good.

"One reason why we're gunshy about using 900 services is that many businesses block access to 900 services so [some customers] wouldn't be able to get through to us," said Dan Gonos, project manager at Domino's Pizza, Inc. in Ann Arbor, Mich. Another

reason is that the 900 services industry has a negative image because of its less reputable purveyors."

Concerned about the public perception of the 900 services industry, IIA members plan to clean their own house by adopting standards of practice, Metalitz said.

Another industry group, the National Association for Information Services (NAIS), was formed in June "to ensure the survival and prosperity of information service providers." The NAIS hopes to finalize in October its Code of Responsibility and Compliance Guidelines."

Greg Casey, general counsel for 900 services provider TeleSphere Communications, Inc., recently testified before a House subcommittee on behalf of TeleSphere and the NAIS. He charged that Gordon's bill could "impose substantial costs on carriers and information providers, resulting in higher charges to consumers for those services that do remain available." ■

Unisys unfolds blueprint

continued from page 1

through software," said James Unruh, Unisys' president and chief executive officer.

Some 150 existing Unisys products will play a role within IIE, as will new products for Unisys A Series mainframes announced last week.

The architecture won't force a radical change in the networking strategies of many Unisys users because IIE is based in large part on OSI, which Unisys has been emphasizing for years. But users still welcomed the announcement as a reaffirmation of the company's direction.

"It isn't revolutionary," said John Goodfellow, president of the Unisys Users Association. "It's an evolution of ideas that've been coming together."

Under IIE, Unisys outlined three types of computing platforms and the functions they will provide in a customer's network.

pabilities.

The products fall into three categories. The first is the Applications Subsystem, which includes Applications and Information Services (A&IS) and Information Management Services (IMS).

A&IS defines a set of application development tools, including such Unisys tools as the ALIY, LINC and MAPPER fourth-generation languages, for developing applications that run on any Unisys platform.

IMS specifies products that handle the storage, retrieval and sharing of data throughout a network. Multiple vendors' data base products are included — such as Oracle Corp.'s Oracle and IBM's DB2 — along with an SQL interface. Eventually, object-oriented data bases will also be included under IMS.

The second category, known as the Management Subsystem, comprises what are called Systems Management Services (SMS), a group of products that support network management, as well as systems and workstation management, in an IIE environment. AT&T's Accumaster Integrator and Timeplex's TimeView net management system are supported under IIE. Unisys has pledged to roll out SMS products over time that conform to OSI management specifications.

IIE's Networking Subsystem comprises Systems Connectivity Services (SCS) and Distributed Systems Services (DSS). The Networking Subsystem is intended to provide OSI-based products that link Burroughs Network Architecture- and Distributed Communications Architecture-based machines with one another and with computers from other vendors.

SCS includes products related to Layers 1 through 4 of the OSI reference model, which provide the physical, link, network and transport services used to connect any of the three IIE hardware platforms. SCS specifies use of IEEE 802.3 Ethernet, 802.5 token-ring and Fiber Distributed Data Interface LANs, plus wide-area networking services such as X.25 and Integrated Services Digital Network offerings.

Products specified under DSS provide services described in OSI Layers 5 through 7, which are the session, presentation and application layers of the model. Included are OSI applications such as the X.400 Message Handling Service and File Transfer, Access and Management (FTAM).

Unisys last week beefed up its suite of OSI products by announcing OSI products for its A-Series mainframes, the last remaining Unisys platform to receive OSI support. The A Series will be able to run FTAM, as well as Unisys' 1984 X.400 application and its OSI InterProcess Communication product, which provides the base OSI protocols upon which Unisys or user-written OSI applications are supported. ■

HP's OpenView will run on Sun

continued from page 2

workstations under HP-UX, HP's Unix implementation.

Both versions can manage network devices and element net management systems that support the Simple Network Management Protocol (SNMP).

The company plans to enhance both packages over time to support other net management protocols such as the one currently being defined by the Open Systems Interconnection Network Management (OSI/NM) Forum, a group of vendors devising a common implementation of OSI network management standards.

Support of the OSI/NM Forum's protocol will enable both OpenView Network Management Server products to exchange net management data with other integrated net management systems, such as NetView and Digital Equipment Corp.'s DEC Manage-

ment Control Center.

HP also added SNMP support to its LANprobe LAN monitoring software, which is designed to collect such information as usage statistics on remote LANs. With SNMP, LANprobe can pass data to an OpenView Network Management Server. The same software can be used to link microcomputers running Novell, Inc.'s LANtorn, a LANprobe competitor, to an OpenView Network Management Server, HP said.

In addition, the vendor made a few other announcements including:

- SNMP support for its existing MS-DOS-based OpenView Windows software, which supports a common graphical user interface based on Microsoft Corp.'s Microsoft Windows. This will enable stand-alone network management systems built using OpenView Windows to communicate with OpenView Network Management Server. OpenView Windows was also upgraded to support Microsoft Windows 3.0.

- The ability for OpenView Network Management Servers to kick off system or network management applications running on HP 9000 minicomputers or workstations.

- Its intention to work with other vendors to develop software that will enable OpenView Network Management Server to support other vendors' extended SNMP Management Information Bases (MIB). Some vendors have added proprietary extensions to the standard MIB to support nonstandard functions or data.

OpenView Network Management Server for Sun is available in two versions: one includes an application development tool kit and sells for \$30,000; the other does not include the tool kit and sells for \$7,000. Both versions are scheduled to ship in the second half of 1991.

The other enhancements are being offered under maintenance programs to current users and will be added as standard features to OpenView. ■

Wilhelm Staudinger, head of nonvoice network services at Deutsche Bundespost, said few users have demonstrated the need for the Basic Rate Interface (BRI) services the carrier offers.

To counter user apathy, the carrier kicked off an ISDN sales promotion last April in which it offered free BRI access for one year to any customer that buys an ISDN personal computer adapter. In addition, Deutsche Bundespost is subsidizing a \$1.3 million advertising campaign for ISDN adapter manufacturers.

Deutsche Bundespost purchased 5,000 ISDN personal computer adapter cards for internal use. "If we use them, customers would think it's good," said Staudinger. ■

open systems standards to provide for a uniform, companywide progression in the OSI direction.

"We don't want people choosing one standard over another in a market where competing standards are available," he said. "Our challenge is to get people to go [in] the same direction."

Germans snub ISDN

At a separate session during the conference, the large German telecommunications carrier, Deutsche Bundespost Telekom, acknowledged that users in Germany have shown little interest in Integrated Services Digital Networks.

Tying OSI to business needs

continued from page 6

jected target dates as far ahead as 1993 for product releases. The study helped convince management that migration to OSI was possible, given the products and services available today, said Pinson. But, he cautioned, the study also revealed two key open systems requirements — distributed data bases and security features — where vendors appear weak in product delivery.

Du Pont, however, felt sufficiently confident in the market outlook to move ahead with its open systems plans. Pinson said even after committing to open systems standards, du Pont decided it needed to select a core of

Chief speaks on open systems

continued from page 1

Open Systems International (COS).

In your initial remarks as the newly elected president of the UAOS, you said network managers are mad as hell and aren't going to take it anymore. What exactly are you mad about?

Network managers at larger corporations recognize that it's nearly impossible today to build enterprise networks that let users share data across different computing platforms. We have many bullet holes and wounds from trying to integrate enterprises.

Moreover, network organizations are under pressure from top management to improve productivity and reduce costs. It's difficult to do that without open systems. Integrating proprietary systems is costly, labor-intensive and fraught with problems.

Members of the UAOS have decided to stop talking about these problems and do something about them. We may not always do the right thing, but some action is better than no action.

What are the benefits of open systems?

Today, large companies are forced to purchase information technology on the basis of its compatibility with existing systems. Open systems would enable companies to purchase products according to price, performance or functionality.

The availability of plug-and-play products would cause prices to drop significantly. It has been estimated that open systems would enable companies to reduce their information technology expenditures by 7% to 20%.

We want to standardize data communications so that it's as easy to send data anywhere in the

globe as it is to pick up a phone and call. But vendors don't want their products to become commodities. That forces them to work harder for their dollars.

What is the biggest obstacle impeding the growth of open systems?

Education. We need to raise awareness of executives, middle managers and technicians about the benefits of open systems.

Six months ago, I would have said it's important to educate people about open systems technology, but now I realize that the focus on technology in the open systems debate is part of the problem. We need to focus on the potential of open systems to change organizational structures for the better and improve the way people communicate, make decisions and carry out their jobs.

Realistically, what chance does UAOS have of accelerating the acceptance of open systems?

We are optimistic. We have identified nine barriers to open systems and brainstormed on ways to overcome them. If we can solve one of those barriers in the next two or three years, we stand a good chance of making progress.

There is nothing as powerful as an idea whose time has come — open systems is just such an idea. Once we raise people's awareness about open systems, they will change how they think about and use technology.

We hope to get people asking the right questions. Once they start asking questions, they will begin looking for solutions.

You've said the UAOS won't examine technical issues or standards. Why not?

Tons of consortia are already doing that. That's part of the problem. These groups are looking at a small piece of the prob-

lem and ignoring the big picture.

We can't divorce ourselves from technology; we have to be able to marry technology and business requirements. Our goal is not to judge between competing standards but to fix the process that created multiple standards in the first place.

We're trying to approach the open systems debate from a higher level, one that stresses education and consciousness-raising. We believe that once people are thinking in unison about open systems, the technology issues will resolve themselves.

Do you have any ideas for resolving, say, the dispute between Unix International

We need to focus on the potential of open systems to change organizational structures for the better.



(UI) and the Open Software Foundation (OSF)?

We might hold a public forum in which representatives from both groups are asked one pointed question: "What are you going to do to provide interoperability between your two versions?" If the forum had a lot of visibility, it would be difficult for them to escape without realizing how foolish it is for them to have incompatible systems.

We also want to challenge vendors that say they support standards but then add some extra capability above and beyond the standard to set themselves apart. That sabotages the whole open systems standards effort. At some

point, we are going to pick one or two vendors that are guilty of doing this and make public examples of them.

We feel it's important to challenge some of the things that vendors and standards groups have done. We're going to make some people uncomfortable. Hopefully, as a result, these people will put aside their self-interests — and concerns about the size of their checkbooks — and begin working together to solve end-user problems.

Initially, you and others in UAOS expressed reservations about joining COS. What changed your mind?

If COS had not restructured itself early this year, I doubt we would have voted to join it.

This spring, however, COS underwent a metamorphosis. It re-evaluated its mission, restructured its organization and hired a new chief operating officer, who is making strides toward putting the group on a solid financial footing and improving the group's image.

Are you concerned at all that joining COS will diminish the visibility or credibility of the UAOS?

No. We get to set our own agenda, decide when and where we meet and whom we talk to. We write our own bylaws and charter, and we get to participate in COS as voting members. We get the best of everything.

What kind of relationship will you have with standards bodies and vendors?

COS already has formal ties with standards bodies. It has written agreements with international consortia such as [Standards Promotion and Application Group]. COS will also help us bring together vendors and users in a common forum so we can talk more freely. ■

AT&T to unveil cell relay switch

continued from page 2

step to the next-generation public network," said Harry Bosco, data networking vice-president for AT&T Network Systems.

"We are committed to working with our telephone company customers to make SMDS a success," he added.

The new switch, which is actually an adjunct to the company's 5ESS central office switch, is the crown jewel of AT&T Network Systems' broadband product line.

That line was announced a year ago and includes multiplexers and fiber transmission systems, as well as T-1 and T-3 Digital Access and Cross-Connect Systems.

The BNS-2000 will house T-1, T-3, Integrated Services Digital Network and other network interfaces. Customers will be able to access the switch using various AT&T customer premises terminal adapters, including an adapter to tie Ethernet and Fiber Distributed Data Interface networks to the switch over a T-3 line.

Other interfaces will make it possible to support Transmission Control Protocol/Internet Protocol, token-ring and Apple Computer, Inc. AppleTalk local-area networks with T-1 links. AT&T would not say which vendors will offer the terminal adapters.

The BNS-2000 switch is currently available to telephone companies for trial use and will be generally available by the third quarter of 1992, AT&T said. Bell South Corp., Nynex Corp., Pacific Bell and Southwestern Bell Corp. are using an early version of BNS-2000 in current SMDS trials, AT&T said.

"[Carriers'] strategy is to move customers away from private-line services and toward SMDS, which supports switched T-1 and T-3," said Bart Stuck, president of Business Strategies Group, a Westport, Conn., consultancy. "Users benefit because they only pay for the bandwidth they use."

The announcement of the BNS-2000 switch represents an about-face by AT&T, which in 1988 signed a technology licensing agreement with QPSX Communications, Inc. of Perth, Australia, to develop a metropolitan-area network switch for sale to local phone companies and for use in AT&T's long-haul network.

Industry sources said the relationship between the two companies deteriorated, leaving AT&T to develop and build the BNS-2000 product line instead of using QPSX's Queued Packet and Synchronous Exchange.

"AT&T originally planned to use QPSX's MAN switch but decided instead to have AT&T Bell Laboratories develop the technology for the switch, which AT&T will manufacture in Ohio," said one source close to the project who requested anonymity. ■

U.K. price caps may lower rates

continued from page 5

international telephone calls has increased sharply since 1988 instead of being eroded by competition," Carsberg wrote in a public notice explaining his actions.

"There is, therefore, a strong case for bringing international prices under a price cap [and allowing international resale]," he said.

High profits

According to Oftel, British Telecom earned about \$1.2 billion on international services in the fiscal year ended March 31, 1989, which is about a third of its total after-tax profits of \$3 billion against total revenue of \$21.1 billion. Analysts said the majority of British Telecom's international profits are derived from services

to the U.S.

While Carsberg's actions do not guarantee that new regulations will be adopted, as the country's chief regulator, his requests are almost always enacted by the government. The new regulations could actually take effect early next year.

For price caps, Oftel will negotiate with British Telecom to find an acceptable international price cap formula.

If no agreement is struck, Carsberg said he will ask the U.K.'s Monopolies and Mergers Commission to order British Telecom to accept a formula designed by the government.

Price caps would require British Telecom to keep its price increases below a specific ceiling. It is not yet known at what level that ceiling would be set.

On the resale front, the U.K. is expected to let users begin reselling capacity on private lines to

countries that allow resale when a major review of the existing regulatory structure is completed. That should be finished by the spring.

Among the countries that currently allow international resale are Canada, Hong Kong, the Philippines and the U.S., according to Barry McAdam, a principal at Associated International Information Technology, Ltd., a network consultancy in London.

SCN jumps in

One start-up service provider, Securities Communications Networks, Inc. (SCN) in New Canaan, Conn., says it plans to resell services between the U.S. and U.K. within seven days of formal adoption of the new rules.

SCN is a venture capital-funded company that plans to begin offering international private-line services to the brokerage industry later this month ("Start-

up firm to sell cut-rate int'l lines," NW, Aug. 27).

Users sending 9,240 minutes of switched traffic per month from London into the U.S. public switched network through an SCN point of presence in New York would pay about 84 cents a minute or less for the service, according to David Castillo, SCN's chief operating officer.

This compares to standard international direct-dial long-distance prices from British Telecom of \$1.33 a minute during prime calling hours and \$1.18 per minute during standard calling times, Castillo said.

McAdam predicted that resellers would be able to offer discounts of 20% to 30% over switched services from dominant carriers. He said resale could fare better internationally than domestically because international switched service prices are higher. ■

Hyatt cuts over reservation net

continued from page 2

since 1987, Hyatt also opted to revamp its Systems Network Architecture backbone network, which carried the bulk of the company's traffic.

Hyatt used value-added networks and dial-up lines to support electronic mail and other administrative functions.

The company retired what one Hyatt executive described as "a very rudimentary" SNA backbone in favor of one of the largest commercial Transmission Control

Protocol/Internet Protocol backbone nets in the world.

The network, which was built and will be managed, operated and maintained by Infonet Services Corp. under an outsourcing agreement, consists mainly of 56K bit/sec dedicated lines linking roughly 100 hotels, the company's data center and a reservation center in Omaha, Neb.

Not only does the TCP/IP network have better performance than the 9.6K bit/sec SNA backbone, it also serves to centralize multiple applications that were previously scattered across several nets.

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"The network enables us to provide the applications we are going to need in the '90s to offer customers better quality service," said Gordon Kerr, Hyatt's vice-president of MIS. "When a customer comes to us, he doesn't come to us because we have a single hotel; he comes to us because we are a network of hotels. Therefore, we need the guest history information about that customer — special requests and award program balances, for example — to be equally accessible from all points on the network."

Regardless of whether a caller dials into a local Hyatt hotel or the company's reservation center in Omaha, the net will give reservation agents access to a centralized data base of room availability and guest information.

Previously, reservation agents at one location could not easily access information at other hotels, Hyatt executives said. The SNA network and IBM host were the stumbling blocks in that Hyatt practically had to force the link between its Unix computers and the SNA net, Kerr said.

Anatomy of the network

The heart of the network is at Hyatt's Oakbrook Terrace data center, dubbed Hyatttech. This is where the AT&T System 7000 servers support a central reservation data base, as well as other repositories for the hotel chain's marketing and financial applications. The Unix hosts reside on an Ethernet and pipe traffic onto the TCP/IP backbone via Advanced Computer Communications (ACC) routers.

Hotels in the U.S., Canada and the Caribbean are linked to the data center via leased 56K bit/sec lines from MCI Communications Corp. or, in some cases, by 19.2K bit/sec leased lines where higher speed lines are not available. Overseas locations are connected to the net via Infonet's X.25 public network. Hyatt's reservation center in Omaha, which is staffed by some 300 reservation agents, is tied into the data center via T-1 lines.

The typical network configuration at Hyatt's hotels consists of an AT&T or HP minicomputer, as well as 20 to 40 host-attached terminals and personal computers, all of which are connected via Ethernet.

Users on the local-area networks communicate with other hotels and the data center by sending traffic onto the wide-area network via a local ACC router. By using routers rather than bridges, Hyatt is able to segment the huge TCP/IP backbone into subnets that are easier to manage.

Hyatt has decided to keep its voice and data networks separate for the most part, Kerr said. The company recently signed a Tariff 12 contract with AT&T for voice and data services, but he declined to disclose the value of that agreement. □

Federal Reserve upgrades system

continued from page 5

serve banks operates a network that serves local banks. Typically, banks access FedNet via dedicated or dial-up links to regional mainframes.

But the regional banks use different network equipment, element management systems and protocols.

For example, 10 of the regional banks support local access to FedNet using IBM Systems Network Architecture protocols, while two use X.25.

That creates a management problem for the regional Federal Reserve banks and makes it difficult for them to offer services many customers want, Giacciai said.

For example, a bank in western Massachusetts may prefer to hook into the New York Federal Reserve to conduct funds transfers because the New York bank is closer. But because the bank's account is controlled by the Boston Reserve, Federal Reserve policies dictate that the transaction must be forwarded from New York to Boston over the FedNet backbone.

Since the transactions can involve millions of dollars, the Boston Federal Reserve is required to monitor the bank's link to the New York Reserve. But since the two banks use different systems, special arrangements must be made to enable one Reserve bank to monitor a customer's dealings with the other.

Standardization would enable regional Federal Reserve banks to monitor local links anywhere on FedNet, making it possible for customers to deal with any regional Reserve bank.

Such a move would also make it easier for the Federal Reserve to support the growing movement toward interstate banking since bank holding companies could have information about the activity of subsidiaries easily forwarded over FedNet to their headquarters.

Standardization will also make FedNet more immune to outages, Giacciai said, because FedNet users could maintain network links to multiple regional Federal Reserve banks.

Disaster recovery would also be improved. Currently, 10 regional Reserve banks share a single backup data center in Culpeper, Va., which maintains equipment from multiple vendors to support the different needs of the regional Reserve banks.

By standardizing on a single network system for local access, only a single equipment configuration would be required in the disaster recovery center. Giacciai said that would significantly reduce the time needed to recover to a backup center. This could save FedNet users millions of dollars in interest penalties on de-

layed funds transfers.

Accommodating rising transaction volumes is also a vital part of the project. Currently, about 70 billion characters of data a month are sent over FedNet. That total is rising by about 10% per year. But data volumes could soar dramatically, Giacciai said, if users begin to send check images over FedNet, which is expected within a couple of years.

"We've got to have a network that can accommodate that," Giacciai said, adding that replacing 56K bit/sec lines with T-1 and fractional T-1 facilities will help meet these bandwidth needs.

Net management is key

One key to the success of the project is finding a network management package that can meet the Federal Reserve's unique requirements.

The Reserve wants each of its regional banks to be able to monitor links used by their customers to access Reserve banks around the country.

While some element management systems support this capability, integrated network management systems do not, according to Giacciai. He said he expects vendors to support this distributed capability within the five-year time frame of the project. □

NETWORK WORLD

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ALLIGATORS IN THE SWAMP

*Unforeseen problems that can
put the bite on your network*

The battle for bandwidth

When large file transfers cause headaches, data compression can be the cure.

The need for more bandwidth is the one thing that just didn't come up some time back when you were planning for the new overseas circuit. Now upper management wants "blood from a turnip." They have a valid case and some money, but not enough for a new dedicated circuit. Somehow you need to find a solution.

This situation recently plagued the U.S. and U.K. MIS departments of Torrance, Calif.-based Ashton-Tate Corp. A worldwide software manufacturing organization, Ashton-Tate is conducting development activities on different continents.

The company relies heavily on two cooperative, yet distinct, network and computing resources for its operations worldwide: a Unix-based development network running the Transmission Control Protocol/Internet Protocol suite, which was not easily accessible outside of the U.S.; and a Banyan Systems, Inc. VINES network comprising internetworked local-area nets at each of the domestic and international sites.

Not long ago, Ashton-Tate's telephone costs were rapidly increasing due to growing voice, LAN-to-LAN, data and facsimile communications between its California office and its office in Slough, England. As a solution, the company installed a dedicated communications link between the two hubs. Using a Republic Telcom Systems Corp. RLX-8 multiplexer and a 56K bit/sec satellite link, Ashton-Tate gained four voice channels, one fax channel and a dedicated data channel for its Banyan network running at 19.2K bit/sec. This setup not only provided superior service, but also would pay for itself very quickly.

Changing roles

However, shortly after this solution was implemented, Ashton-Tate decided to change the role of its U.K. office. Instead of being dedicated to sales and translation activities, it would become a full-fledged development center.

As U.K. development activities expanded, so did the need to share information with the U.S. development sites. For a while, long-distance modem calls were made to sites in California and Connecticut using high-quality 9.6K bit/sec error correcting modems. File transfers on the order of 3M to 10M bytes were common. According to Michael Thorpe, resident developer of the U.K.-based European Development Centre (EDC), "a file transfer of 3M bytes would take close to three hours to get [from the U.S. to the U.K.]."

EDC Manager Alice Maynard initially proposed using a time-division multiplexer to split the dedicated Banyan 19.2K bit/sec channel into two 9.6K bit/sec channels, one for the EDC and the other for the Banyan network. The EDC's 9.6K bit/sec channel would then be statistically multiplexed into three 2,400 bit/sec asynchronous channels, which would provide three "pipes" for the three-port Novell, Inc. communications server in the Slough office and three modems in the Torrance office.

However, after considering all of the extra communications gear that would have to be introduced into the circuit — as well as the delays that would be created by transferring files at 2,400 bit/sec and reducing the Banyan bandwidth by half — it was agreed that this would not be a viable solution.

A potential solution to reduce the amount of communications gear was to use a four-port statistical multiplexer, which would allow port speeds to be configured as needed. However, to use the multiplexer effectively, the Banyan link would have to be changed from the synchronous High-Level Data Link Control protocol to the less efficient asynchronous protocol. This solution would also reduce the Banyan network's bandwidth.

Tim Trimble, Ashton-Tate's U.S. manager of network/technical systems, suggested another approach. Using the Banyan network's TCP/IP routing capabilities,

the European developers could run a terminal-emulation session and connect over the existing Banyan network to Unix hosts in the Torrance office. Unfortunately, because of the enormous file sizes, this solution also would reduce performance and would not allow the EDC to access other companies without incurring long-distance phone charges. According to Sherry Ridge, Ashton-Tate's U.S. telecommunications supervisor, adding one leased 19.2K bit/sec circuit to Europe would have cost about \$4,000 per month, not including the equipment at both ends and the installation charges. So it was back to the drawing board.

What was really needed was a hybrid synchronous/asynchronous solution in one box that would not hamper the Banyan network's performance.

The all-in-one box

Frustrated, EDC began contacting vendors in the U.K. for a possible solution. Finally, a light appeared on the horizon. U.K.-based Trend Data Link, a data communications equipment vendor and consulting firm, worked with Ashton-Tate's U.K. MIS department to engineer a solution based on Memotec Data, Inc.'s MC504 data compression multiplexer. The unit could be configured for a combination of synchronous and asynchronous ports and speeds. The data compression enabled Ashton-Tate to realize a fourfold increase in transmission speed on the 19.2K bit/sec data link.

Trend Data Link and Calabasas, Calif.-based Trend Data Systems, Inc. installed MC504s at the Slough and Torrance sites to interface with the 19.2K bit/sec data port on the RLX-8. At the Slough site, a Novell communications server was installed and three 19.2K bit/sec asynchronous ports were configured to interface with the MC504. On the fourth port, the MC504 was configured for HDLC at 38.4K bit/sec to accommodate the Banyan net's requirements. This offered a theoretical throughput of more than 90K bit/sec on a 19.2K bit/sec synchronous data channel.

Three Telebit Corp. T2500 modems with built-in Unix file-transfer support and error correction were also installed at the Torrance site. The T2500s locked the RS-232 port speed on the modems at 19.2K bit/sec for each asynchronous interface to the MC504. This way, regardless of the speeds at which the modems connected to other modems, the three channels between the U.S. and EDC Novell communications server remained at 19.2K bit/sec. This made for quick response and screen refreshes on the emulated terminals on the Novell/Banyan network in the U.K.

In addition to providing the U.K. office with U.S. dial-out capabilities, this solution doubled the Banyan network's link speed from the original 19.2K bit/sec to 38.4K bit/sec HDLC. Systems analysis capabilities, provided via the MC504's built-in "data scope," allowed users to observe the data in their choice of formats — ASCII, hexadecimal or EBCDIC — as it moved across a channel. Users can also monitor the percentage of channel usage. These features aid in problem diagnosis.

Ashton-Tate's U.K. and U.S. employees were pleased with the solution. "We've cut our file-transfer time by nearly a third," Thorpe says. Another bonus was that it yielded a cost savings. The expense incurred because of the upgrades would be paid for from the savings realized in less than nine months.

Unforeseen requirements are inevitable. No matter how much planning and crystal ball gazing you do, an alligator will rise from the swamp and surprise you. When you find yourself in a sticky bandwidth and political situation, don't forget the satisfying and now economical solution of data compression. ■

IT'S HARD TO DRAIN THE SWAMP when those reptiles keep getting in the way. To share your "alligator story," call Susan Collins, assistant features editor, at (508) 820-7413 or fax your idea to (508) 820-3467.

DesRosiers is a senior data communications analyst for Ashton-Tate Corp. in Torrance, Calif.

By DAN DESROSIERS

"Our man in Geneva can now get vital information right to the desks of our traders on four continents. In seconds."

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From an interview with Eric Dickstein
of Continental Grain.

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Do you use third-party lines?

"Yes, depending on needs and economics. Mostly, it's GEIS, plus some point-to-point lease lines and dial-up facilities. Even a dedicated 56KB satellite link. And it's all totally transparent."

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